RANG MAHAL

THE SWEDISH ARCHAEOLOGICAL EXPEDITION TO INDIA 1952—1954

by

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WITH CONTRIBUTIONS BY HOLGER ARBMAN,
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PREFACE

In December 1945, when I was vice-president of the International Alliance of Women, I was invited to take part in the annual meeting of the All India Women's Conference at Hyderabad, Sind, and I naturally took the opportunity of visiting Mohenjo-Daro and after that Harappa and Taxila. A few years later the Indian peninsula became two independent nations, each with a representative in Sweden. The Indian ambassador, Mr. R. K. Nehru, and I had several discussions about the prehistory and early history of the Indian peninsula and the many relics of these early epochs During these discussions the idea of a Swedish archeological expedition to India was put forward, an idea which received the keen support of Mr. Nehru.

When it appeared that several institutions and private persons were willing to give such an enterprise the necessary economic support, a committee was set up to examine the project in detail. This committee consisted of the following persons· Professor H. S. Nyberg, chairman, Mr S. Stromgren, hon. secretary; Mr S. Thorell, hon. treasurer; Professors T. J Arne, A. Boëthius, H. Frisk, G. Lindblom, together with myself as leader of the expedition. To our great delight H. M. King Gustaf Adolf offered the expedition his gracious patronage and, in his own unequalled way, His Majesty has given the expedition his support and shown an interest in its work, for which we are deeply grateful.

At the outset the committee received a donation from Kabi Ltd and Swedish Match company for my trip to India in 1951 with the object of looking into the possibilities for an excavation. With the help of the Swedish minister in Delhi at the time, Gunnar Jarring, who showed considerable interest in the expedition, I not only made the necessary contacts but received the positive support of the authorities. The Director-General of Archaeology in India at the time, the late Mr. N. P. Chakravarty, was favourably disposed, and, in consultation with Shri A. Ghosh, suggested certain areas which would provide a suitable field of operations for a Swedish expedition Above all he recommended the dried-up river-bed of the Ghaggar in the Bikaner desert, where the Department of Archaeology in India had begun a preliminary survey and had collected and recorded finds from a large number of mounds of various dates. With Mr. Ballabh Saran of the Department of Archaeology as an expert-guide I made a tour of the area. I also visited Matura, with Mr. A. Ghosh, and Sirsa, with Mr. Shankar Das, since these places had also been suggested as suitable sites for excavation

The great consideration shown to me by the Department of Archaeology when I first approached them in this matter was given me in the same unstinted way during all the time in which Shri M S. Vats was Director-General, and after him Shri A. Ghosh, to whom I owe a special

debt of gratitude for his interested support and understanding, without which the task of the expedition could not have been carried out. Many other officials of the Department of Archaeology also took an interest in the work of the expedition and showed a willingness to help, especially the Joint-Director-General, T. M. Ramachandran, and Messrs. S. Roy and B. Saran. I should also like to take this opportunity of thanking the Chief Minister of Rajasthan, Shri Jainarain Vyas and Dr. Satya Prakash, Director of the Department of Archaeology of Rajasthan.

For economic assistance the Expedition respectfully thanks His Majesty the King. The following Swedish trusts and institutions have also given the Expedition their support: Humanistiska Fonden (The Humanistic Fund), Kungafonden, (The Royal Birthday Fund), Längmanska Fonden and Stiftelsen Lars Hiertas Minne (Lars Hiertas Memorial Foundation), and also Swedish Indian Society. Among other generous donators must be mentioned Ostasiatiska Kompaniet, who placed ten free return passages Sweden-India at our disposal and also shipped our excavation material, food supplies and finds free of charge; without this help the expedition could not have numbered such a large staff. Our warmest thanks are also due to Swedish Match Company for wholehearted assistance in many respects and to Kooperativa Förbundet, whose goodwill in India proved an extremely valuable asset. It is a pleasure to mention among those who contributed to the funds of the expedition the Tata concern of Bombay and Åhlén och Holms Ltd of Stockholm. Many private individuals have shown an interest in the excavations in an encouraging and very gratifying way, among the largest donators being Mr Olle Engkvist, Mr C. L. Rydh, the late Mr Anders Sandrew and Mrs Astrid Strömgren. Many firms helped us considerably by providing us with supplies free of charge.

In countless ways the expedition received support and assistance from the Swedish Legation in Delhi, especially from the minister at the time, Per Wijkman, and from the Swedish General Consulate in Bombay, where the Consul-General, Tom Rydin, among other things never seemed to tire of helping us with despatching our effects to and from Sweden and all the paper-work this entailed.

In giving this account of the debts of gratitude incurred by the expedition to all those who assisted us with help and advice, I must mention specially the untiring efforts which the hon. secretary of the committee, Mr Sven Strömgren, devoted to all aspects of our work before, during and after the excavations.

In October 1952 I went out to India to make the final arrangements on the spot. On Christmas Eve the same year the other members of the expedition arrived. The expedition consisted of: archaeologists Professor Holger Arbman, Dagny Arbman, B.A., Louise Halbert, M.A., Göran Bergengren, student of archaeol., all from Lund; geologist K. Gösta Eriksson, M.A., Björn Allard, student of archaeol. both from Uppsala; David Hummel D.M., from Gäddede; secretary Karin Munck af Rosenschöld, student of law, photographer Öved Hultmark, Hildegard Halling-Lindfelt, student of medicin, who went out independently and for a short time kept house for us, and myself, all four from Stockholm. As an all-round assistant we had the pleasure of having Major Ragunath Singh from Bikaner, whose intimate knowledge of local conditions was extremely useful to us. Our workers came from the nearby village and thereabouts; at the most there were 40 of them, of whom 3 women.

The expedition was granted a license by the Department of Archaeology in Delhi to dig at

Rang Mahal near Suratgarh in Bikaner. The work of excavation began during the first days
of January 1953 and continued until the end of April the same year. Holger and Dagny Arbman
and David Hummel were obliged to leave at the end of March to take up their normal duties in
Sweden. Dr. Hummel took back with him to the National Museum of Natural History, Stock-
holm, a collection of botanical specimens which he had made.
Members of the expedition were extremely fortunate in being allowed
wing of the hunting lodge near Suratgarh
During the
House i
exhibitio
photogra... showing representative Swedish antiquities and ... made by the expedition and a number of large framed ... chief collections. Our
kindly lent by the R. Academy of Literature, History and Antiquities, Stockholm. The exhibition
was opened by the late Dr Maulana Asad, then Minister of Education. To our great delight the
Prime Minister, Mr. Jawaharlal Nehru, and Mrs. Indira Gandhi, together with their guest Lady
Mountbatten of Burma, accepted our invitation to the opening of the exhibition and the Prime
Minister was kind enough to make a speech.
After a stay in Sweden during the hottest months and the monsoon, I returned to India in
November for the cataloguing of the finds which must be undertaken before the parting of the
finds between India and Sweden could be done. To help me I had Öved Hultmark, who was
mainly occupied in photographing and drawing the material, and also Major Singh, who helped
me with various tasks such as marking the finds, typing and, with Hultmark, reconstructing some
of the pottery. At the end of April 1954
expedition
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Museum i
While work was in progress on this publication, the Swedish ... over to the Mediterranean
the University of Lund's Historical M
It is both a necessary duty and a
for his full and sympathetic co-
both in field-work and ... for the ... thanks to Hol
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Er
... for the geological section of this publication. A special word of thanks is due to Gösta ..., each of whom
who did all the photographic work in the field, took a large number of archive pictures of objects,
some of which are to be found in this publication, and Öved Hultmark,
large number of the pottery finds, which are also ... and drew the original line-dr
Most of the photogr
Lund, by the prep
with the exception
India. Some few published photographs of finds, now in Delhi, are taken at the Department of
Archaeology and published by kind permission. ... were dealt with by the Department of Archaeology in ... the iron and bronze objects,

Fair copies of drawings and plans were made at the Historical Museum, Lund, by Mrs Eva Sjögren-Wilson and Mrs Agnes Falkenhof, who also made a large number of original drawings of objects. A number of original drawings and fair copies was also contributed by H. Faith Ell, a former draughtsman at the State Historical Museum, Stockholm. To all these assistants I am very grateful.

In the appropriate parts of the text, mention is made of the various experts I have had occasion to consult and there is only room here to mention the chief contributions made by outside experts: the coins were classified at the Ashmolean Museum, Oxford, by Dr. A. D. H. Bivar, the shells at the British Museum by the late Mr. G. L. Wilkins, the bone material at the Museum of Natural History, Gothenburg, by Amanuens J. Lepiksaar, the textile impressions on certain pottery by assistant Märta Lindström, Museum of Cultural History, Lund. The list of contents gives the names of the authors of the various chapters; under plans and section-drawings the name of the original draughtsman is indicated by the initials H.A. for Holger Arbman, G.E. for Gösta Eriksson, L.H. for Louise Halbert, Ö.H. for Öved Hultmark and H.R. for Hanna Rydh.

Translation from the Swedish and revision of parts written in English have been made by Mr and Mrs David Wilson, London, a smaller part is translated by Mr L. B. Eyre, Stockholm.

The spelling of Indian names follows the system used now by the Department of Archaeology in India, in which the points and dashes which used to be placed over and below certain letters in the Romanic orthography previously in use, are no longer employed.

Stockholm and Lund, July 1958

Hanna Rydh

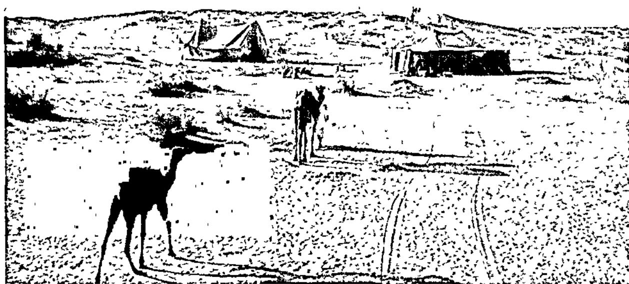


Fig 1 Part of the Rang Mahal Mound, seen from east

THE ENVIRONMENT OF RANG MAHAL

Geographical position. Between the Sulaiman Range and the Aravalli Range in the north-western part of the former Indian Territory lie the provinces of Punjab, Sind and Rajputana Nowadays the Sind, the main part of the Punjab, and the western part of Rajputana belong to the State of Pakistan, whilst the eastern sections of these areas form part of the new Confederation of Rajasthan in the Federal State of India Rajasthan was formed by the integration of a number of princely states, among them Jaipur, Bikaner, Jodhpur and Udaipur. Bikaner is the north-western part of the confederation. In its northern corner on the border of the Punjab there is a dried-up bed of an old river called the Ghaggar. The town of Suratgarh lies where the railway between Bikaner and Bathinda crosses the Ghaggar, and a few miles to the east on the southern bank of the dried-up river is the mound called Rang Mahal (fig. 2).

Geographical features of Rajasthan. Rajasthan is divided into two large geographical regions by the Aravalli Range, which runs in a north-easterly—south-westerly direction roughly through the middle of the country. The eastern region is the most fertile, owing to a more abundant rainfall. In the west is the Great Indian Desert, most of the western part of which (The Thar) now belongs to the State of Pakistan. The Rajputana Desert or the Rajasthan Desert (i.e. the Indian part) consists, especially in the west, of a sterile sandy desert; in the east, in the neigh-

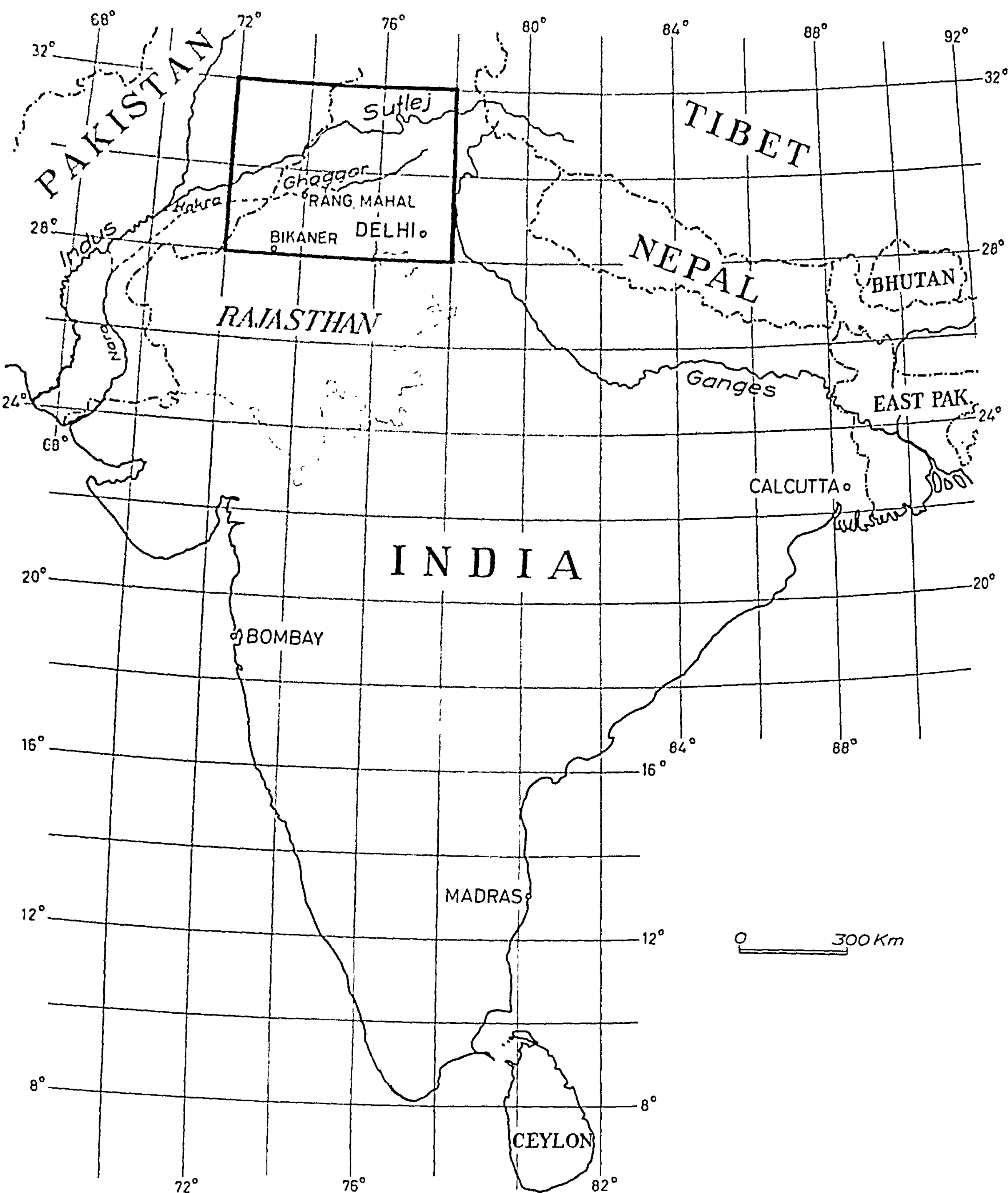


Fig. 2. The Indian Peninsula. The enclosed area shows the position of the map on fig. 3.

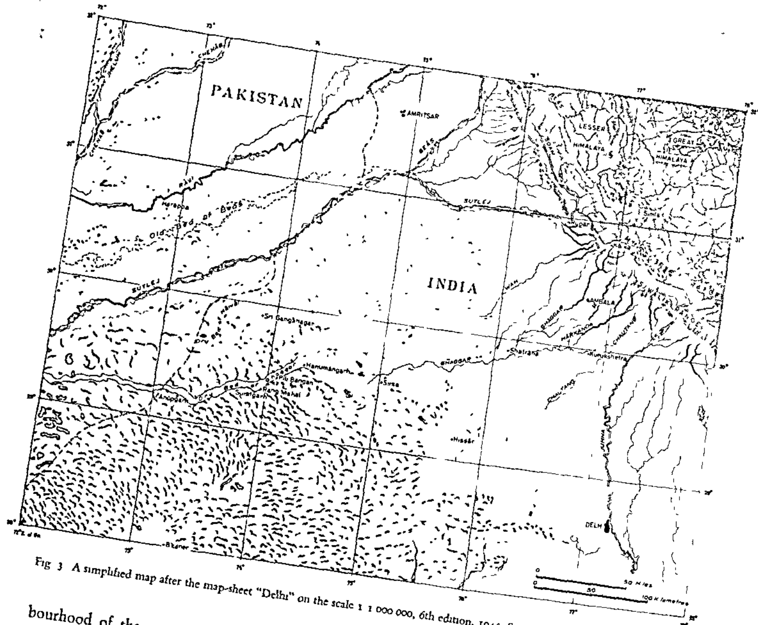


Fig 3 A simplified map after the map-sheet "Delhi" on the scale 1 1 000 000, 6th edition, 1945 Suppled area, eolian sediments

bourhood of the mountains, the desert partly grades into steppe with a dominant semi-arid climate. From a physiographical point of view the desert-area can be subdivided into four sections on the basis of differences in structure, geology and climate. These sub-divisions are a) the Thar section — or the extreme desert, b) the Pat section — an area with many saline lakes, c) the Ghaggar Plain — a transitional area in the north between the desert and the river-plain of the Punjab, this area has a large number of dry river beds and ancient channels, and d) the semi-arid Steppe desert of the Rajputana uplands.

The Rang Mahal area forms a central part of the Ghaggar Plain (fig. 3). Pithawalla (1952) writing about the Ghaggar Plain says: "A special feature of it is that there is a large number of dry river-beds and ancient channels, now waterless and abandoned but flanked by continuous ridges of sandhills, even protected by growth of scrub in the midst of the riverine belts. Seen from the air they disclose a pattern of a gigantic river system, which must have once flowed perennially and allowed the large number of human settlements, which must have been flour-

ishing cities in the past. The beds show firm loamy soil, lying between light sand areas on either side and so rich that even a slight shower of rain would make it very fertile. Parts of the flood plains called "Kutcha" land, once flooded by rivers, now lie barren. The fluviatile character of the older alluvium in this tract has been marked in the silt, sand and gravel of the mantle containing fresh water. The wind agency has completed its work and spread loess all over. Today in this Section, there is an average rainfall of about 10 inches but in lean years it is as low as 3 inches. The result is that agricultural life is uncertain and people live only on a pastoral plane. If this area is given enough water, the desert would be turned into a garden ..."

In the description that follows an attempt will be made to contribute towards the solution of certain geological and archaeological problems of the area, on the basis of evidence gathered by the expedition in the desert and especially in the Ghaggar Plain.

Geology. The lowland area between the Himalayas and the Indian Peninsula is known as the Indo-Gangetic alluvial plain, taking its name from the two dominant river systems of northern India — the Indus and the Ganges-Brahmaputra. The Plain is divided into two by the Aravalli Range, which has a promontory in a north-easterly direction. West of Dehli a number of small ridges of quartzite form the north-eastern end of the Range; further towards the Himalayas these disappear below the alluvials. This Range has not only been the watershed of the region, it has also formed the boundary between the ancient cultural regions of the Indus and the Ganges.

The deposit that now covers the plains consists mainly of formations of sand, silt and clay, laid down during the Pleistocene, i.e. the last geological period. The sediments of this plain have been laid down by these two rivers, their forerunners and their tributaries which have carried their load from the mountains down to the flat plain.

Owing to the great thickness of the alluvial layers in the central part of the Indo-Gangetic plain, the age of its rocky base is mainly known from the peripheral areas where the underlying rocks rise to the surface. The mountains surrounding the Indus' drainage area, all of which have supplied alluvial material to Rajasthan and Pakistan, are of different geological origin. In the east the desert is bounded by the Aravallis — all that remains of one of the oldest mountain systems of the world, which were originally formed during Archean and Precambrian time. Typical kinds of rock from the Archean system are granites, gneisses, quartzites and shales. In the Aravallis two facies of impure argillaceous limestone and, in some districts, reddish sandstone also occur. Sediment derived from this range has filled many different basins, producing, in the surrounding areas, geological formations of different ages in the course of many hundreds of millions of years. To this day the weathered products of the mountains are transported by the rivers to the eastern part of Rajasthan and beyond. In the west the transport of material from this range has been of little geological importance and has contributed but little to the formation of silt and clay in the desert.

In the Jodhpur area in the south-east of the Rajputana desert there is a geological formation belonging to the oldest paleozoic group (Cambrian?). It is known, in India, as the Vindhyan system being named after the great Vindhyan Mountains to the south-east of the Aravalli Range. This system consists mainly of sandstones and calcareous sandstones. The Vindhyans have therefore played an important role as a source of the sediment of the desert.

During the late Paleozoic, Mesozoic and early Tertiary ages the Indian Peninsula formed part of a large southern continent known as "Gondwana land" while to the north of India was a continent called "Laurasia" — the areas now known as Central Asia and Siberia formed part of this continent.

Between these continents was a basin of oceanic magnitude, the Thetys, from the depths of which the Himalayas gradually developed during the Tertiary period. The upheaval of the Himalayas was accompanied by a subsidence of the northern part of its southern foreland — the Indian shield; in this depression of steadily increasing depth, the Tertiary and Pleistocene sediments of the Indo-Gangetic plain accumulated to an enormous depth, the sedimentary material being derived mainly from the Himalayas.

Eolian sediments around Rang Mahal The main part of the Rajputana Desert is covered by windblown sand. The alluvium is mainly revealed along the flood plains and solid rock occupies only a very small part of the area.

The eolian sediments are sand and dust The sand consists of grains the size of which varies between rough limits of 0·06—0·3 mm The action of strong winds on this sand forms such special topographical features as dunes. The smaller-grained material forms a dust which can be carried even by very moderate winds, this material never forms true dunes — merely covering an area like a blanket.

In the Indian desert three principal types of sand formations are distinguished, 1) the transverse dune and the barchan, or horseshoe dune, which "result from a wind regime which blows overwhelmingly from one narrow fan of direction", the ridges running more or less perpendicularly to the prevailing winds (Bagnold, 1941), 2) the longitudinal dune which is formed under conditions of cross-winds, dunes of this form are roughly parallel to the direction of the strongest wind; and 3) the downs or sand sheets which are sand deposits with a flat or gently undulating and irregular surface. These are formed under more irregular wind-conditions and where the mother-material has a comparatively irregular size of grain.

In the south-western and western parts of the desert, where the monsoon is strongest, the second type is common, while in the eastern and northern parts, with less strong winds, the transverse dunes are predominant. The downs can be found throughout the area.

In the area examined around Rang Mahal, the transverse dunes predominate, although certain small areas are covered by sand sheets (fig. 3). Two generations of transverse dunes are found (this feature will be discussed below in the chapter on the river Ghaggar). The earlier generation of dunes is a number of wide and high sand ridges running in a direction which varies between north-west—south-east and east-west. Lakha Dhora, situated just to the west of Rang Mahal, is such a dune. Other ridges of the same age occur, for instance, around Suratgarh. The ridge of Lakha Dhora rises about fifty metres above the present dry bed of the Ghaggar (fig. 7), but earlier it was higher and probably exhibited a more pronounced dune-topography than it does today. The dune grew or remained at a constant height as long as the monsoon was strong enough, but when the monsoon decreased and somewhat different wind-conditions supervened, the dune became more or less consolidated and gradually the wind and rain eroded it more rapidly than the accumulation of the new eolian sand — thus it obtained its present shape.

On the top and on certain parts of the slopes of the dune there are some strata of fresh wind-blown sand, the form and direction of these change according to the direction of the prevailing wind (fig. 3). Between the areas of fresh-blown sand the old dune is laid bare and ditches have been carved along its slopes where a scanty vegetation of trees and bushes has achieved a footing. Traces of many ancient settlements can be found here. Finds of pottery of the Grey Ware Period at the foot of the mound indicate that Lakha Dhora was inhabited long before the earliest settlement of Rang Mahal (see p. 41 f.). It is possible that (on the northern slope of the ridge at least) there was also a settlement of more or less permanent character, contemporary with the period of settlement in the area described below, as a considerable amount of red ware of Rang Mahal type and of red burnt bricks have been found there. The local inhabitants tell of legends about a golden temple or castle within the dune. The dune has not been examined, but it appears that the ridge was already more or less consolidated when the Grey Ware Pottery People inhabited the dune.

Judging by their appearence today, these large dunes were formed by very strong winds which came from the same direction as the summer monsoon. The hypothesis that these were originally longitudinal dunes formed by north-westerly winds is, for many reasons, untenable applied to this area (Enquist 1932). The direction of the prevailing winds both in recent and ancient times, combined with the fact that these large, high dunes developed to the south of the old river Ghaggar, contradicts any such theory. The waters of the Ghaggar formed some sort of a threshold for sand blown from the south and south-west; the sand stopped here and the dunes thus grew to a considerable height.

The climatic conditions which apparently existed when these dunes were formed can be interpreted as follows (cf. also p. 19): the humidity must have been as low as it is today, the winds must have been considerably stronger than is normal in modern times and for part of the year water flowed in the bed of the Ghaggar.

Transverse crescentic dunes of the younger generation are formed in the area by north-westerly and northerly winds and are well developed to the north of the bank of the Ghaggar. The only obstacles which prevent their formation are the water in the Ghaggar during the monsoon and a few bushes.

South of the river bed, where Lakha Dhora forms a very high threshold, the sand has moved against its foot and formed large sand sheets.

Some dunes of this younger generation were mapped in a small area near the village of Karnisar north of Suratgarh (fig. 7). Just south of the village the latest sand deposits form very distinct ridges on the dry and very hard clay surface of the Ghaggar. The ridges run in a north-south direction, at a height of about one metre, having a width of ten to thirty metres and a length of about fifty to two hundred metres.

The dunes which nowadays form the bank of the Ghaggar lie about a hundred metres to the west of the young dunes. The height of these bank-dunes varies between five and twelve metres and they have a more regular dune form than the younger ones. The leeward slope towards the Ghaggar is relatively steep and the windward (north-westerly) side is levelled. The bank-dunes can be a hundred metres or more in width and are many hundreds of metres in length. Some of them carry a scanty scrub vegetation, but are still living dunes. This generation and type of

Station	Jan	Feb.	Mar.	Apr.	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
	Number of days of dust-storm												
Shri Ganganagar	0	0.1	0.3	1.9	6	9	5	1.8	1.8	0.6	0.3	0.1	27
Bikaner	0.3	1.2	1.7	2	3	5	2	1.3	0.6	0.6	0	0.2	18
Jodhpur	0	0	0.3	1.1	2	3	0.9	0.2	0	0	0	0.1	8

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
		Mean rainfall (in inches) and number of rainy days												
Shri Ganganagar	R	0.26	0.44	0.21	0.20	0.24	1.22	2.69	2.78	0.27	0.06	0	0.21	8.58
	D	0.9	1.4	0.7	0.6	0.7	1.9	3.6	3.7	0.7	0.2	0	0.8	15.2
Bikaner	R	0.27	0.27	0.23	0.19	0.59	1.21	3.34	3.60	1.31	0.21	0.05	0.20	11.47
	D	0.8	0.7	0.6	0.5	1.3	2.2	4.9	4.9	2.1	0.4	0.1	0.5	19.0
Jaisalmer	R	0.16	0.19	0.14	0.11	0.31	0.58	2.06	2.46	0.86	0.05	0.05	0.08	7.05
	D	0.5	0.5	0.4	0.3	0.8	1.3	3.4	3.6	1.4	0.1	0.1	0.2	12.6
Jodhpur	R	0.15	0.24	0.11	0.13	0.41	1.42	3.97	4.84	2.40	0.32	0.11	0.11	14.21
	D	0.3	0.6	0.2	0.5	1.1	2.1	5.5	5.9	2.8	0.5	0.2	0.3	20.0

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
		Mean wind direction at 8 hrs and 17 hrs I S T												
Shri Ganganagar	I	N01W	N82E	N85E	S69E	S34W	S21W	S20W	S32W	S38W	S04E	S41E	S54E	S03W
	II	N22W	N21W	N44W	N61W	N70W	S68W	S03W	S28W	N80W	N42W	N36W	N31W	N50W
Bikaner	I	S58E	S36E	S28E	S20W	S46W	S52W	S43W	S45W	S65W	S39W	S10E	S66E	S29W
	II	N07W	N45W	N73W	N76W	S74W	S55W	S36W	S38W	S60W	N77W	N31W	N02E	N87W
Jodhpur	I	N37E	N34E	N36E	S41W	S43W	S47W	S47W	S47W	S58W	N80W	N42E	N38E	S68W
	II	N12E	N64W	N82W	S82W	S62W	S50W	S46W	S40W	S44W	N87W	N08E	N21E	S73W

Station	Jan.	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
	Mean wind speed (in m p h)												
Shri Ganganagar	3.5	4.2	5.4	5.5	6.7	8.5	7.4	5.9	5.6	4.4	3.5	3.6	5.3
Bikaner	3.0	3.6	4.2	4.7	6.3	7.5	7.0	6.3	5.4	3.8	2.5	2.5	4.7
Jaisalmer	5.7	6.8	6.8	8.4	12.5	19.4	14.7	15.3	11.9	5.3	3.1	3.5	9.4
Jodhpur	6.9	6.8	6.9	6.8	10.7	12.6	12.1	9.1	7.3	4.8	4.5	6.1	7.9

dunes seem to be common along the whole northern bank of the dry bed of the Ghaggar in our area, and there is no doubt that winds from north-west and west have formed, and still form, these sand deposits. These wind-blown sand formations are now steadily encroaching on the dry bed of the Ghaggar and will probably cover the river area entirely in the course of a few hundred years, if present climatic conditions remain constant (fig. 3). Many small sand-hills now occupy the river bed; they are usually formed around bushes and will increase in size from year to year. Most of these small sand-hills are laid down in a north-north-east—south-south-west direction as a result of north-westerly winds.

On the southern bank of the Ghaggar, between Suratgarh and Rang Mahal, are some areas covered by sand sheets. They are all formed by winds from north and north-west and their surfaces are somewhat undulating. The sheets between Rang Mahal and Lakha Dhora have a scanty scrub vegetation (fig. 7).

It is possible to conclude from the position and form of the different dunes, that the old large dunes, Lakha Dhora for instance, are formed by winds blowing, in the main, from the south-west and that this must have been the direction of the prevailing winds during the greater part of the year. At a later stage the force of the summer-monsoon decreased and gradually the winter-monsoon (or mainly north-westerly winds) has taken over the role of dune-former. During this later period the dunes of the younger generation have been formed.

In order to appreciate the wind-conditions of the area, an abstract of data taken from the Indian Meterological Department is published here. The figures are valid for the last sixty or seventy years (after S. K. Pramanik, 1952).

Some notes on the structure and texture of the eolic material at Rang Mahal.

In a number of strata the colour of the sand deposits range from brownish-grey to orange-grey, while in others more brownish orange-red hues predominate. The latter shade characterizes the present dunes in the Rang Mahal district. In the various sand deposits that lie beneath the dry river-bed of the Ghaggar (to be described later) it has not been possible to produce evidence of any consistent division into grey or red sand strata, but these strata, possessing either the one or the other shade of colour, are to be found at different levels in the pits and drill-holes investigated.

One feature observable throughout is, that the more micaceous matter contained in the sand, the more emphasized is the grey shade of colour.

In places where there are dark grey hues, the content of organic matter is considerable.

In deeper sand strata which have been measured in the river-bed no structural features, such as cross lamination or ripple laminae, have been observable, but the material occurs in strata apparently without any special characteristics in their structure. The strata lying deeper down are sometimes packed hard and are of a firmer consistency, to which a certain element of fine-grained material may also contribute. A number of minor disturbances in the sand strata have arisen as a result of passages, made by lizards and snakes, having fallen in.

The surface dunes show ripple-marks very distinctly, and frequently a slight cross lamination has formed beneath a certain level in the dunes.

It was impossible for lack of time to measure or to take samples systematically of any of the dunes in the district. The few data presented here regarding the mineralogy and the granulometry of the sand material are therefore intended merely to give a few examples showing the composition of the material and how it can vary.

When the granulometrical analyses were made, the material was subjected to the following procedure (cf. Mac Carthy, 1935):

1) Removal of the water-soluble salts ($CaCO_3$ etc.) by allowing the material to be affected for 15 minutes by 0.01 normal HCl at a temp. of 50°C.
2) After the material had been washed and dried, it was sieved down to 0.062 mm with Taylor sieves.
3) Material finer than 0.062 mm was sieved down further by wet-sieving, i.e. fractionating by water pressure in a 0.044 mm sieve.

The results accounted for here are derived from samples taken from a number of different levels in and on the Ghaggar river-bed.

Sample no. 1, taken in pit no. 15, in the deep sand deposit at a depth of about 500 cms. (Fig. 12). The sand stratum is of a friable consistency, is rich in mica and is of a brownish-grey shade.

Sample no. 2, taken in pit no. 7, in the deep sand deposit at a depth of 400 cms. This stratum of shifting sand has the same colour as the preceding but, in addition, a number of dark spots due to some organogenic element. The upper limit of the stratum is of a wavy formation, indicating that it has had ripple-marks.

Sample no. 3, is from the smaller sand stratum at a depth of 310 cms. in pit no. 8. This layer of sand consists of clearly defined shifting sand in its lowest 3 dm and then passes successively upwards into silt. This stratum may have been a small, low sandhill of the type that is common in our day on the surface of the Ghaggar and which readily forms round a bush or some other obstacle in the terrain.

Sample no. 4, was taken at a depth of 150 cms. from stratum no. 16 in the cavity below pit RM II. The shifting sand is friable and mixed up with sherds, remnants of bones and coal. This stratum has been of the same type as the layer of shifting sand that lies in our day on the southern slope of Rang Mahal (Fig. 15) and which has been deposited under the lee of the mound.

Sample no. 5, was taken from one of the small dunes on the bed of the Ghaggar. The dune lay near pit no. 7, it had a height of about 5 dm, a superficial area of about 10 ms ^{2}, and it lay in an approximately E—W direction. The sample was taken about 1 dm below its top level.

TABLE I

Mechanical analyses of some eolic sediments

Sample no.	Percentage by weight of samples left in each sieve				
	250 µ	125 µ	62 µ	44 µ	<44 µ
1	0.17	6.34	55.00	32.27	5.29
2	0.68	3.35	47.57	20.20	27.60
3	0.08	3.14	54.27	24.00	17.60
4	0.04	4.11	67.41	19.98	7.36
5	0.47	0.60	48.26	30.79	18.74

As will be seen from the Table and Fig. 7, the pure shifting sand material is found to have an extremely well-assorted granulometric composition with a marked centre of gravity between 125 and 62 µ. Moreover, the upper limit of the material is quite naturally sharply defined (125 µ), while the lower limit becomes more diffuse on account of the varying content of dust. This dust is deposited either as eolic material or else it may be brought by the river water and secondarily interstratified in the shifting sand.

AN OUTLINE OF PRESENT AND PAST CLIMATIC CONDITIONS IN RAJASTHAN

Recent Climatic Conditions.

The Great Indian Desert together with its neighbouring lands is a remarkably flat area between the high mountain ranges and plateaus of Kirthar and Sulaiman in Baluchistan, the Salt Range in Sind and the Himalayas and Aravallis in India. The area in the immediate vicinity of the Indus and its tributaries, which forms the greater part of the Great Indian Desert, lies lowest with a height of between 0 and 200 metres above sea level; the land then rises gradually towards the mountains. West of the Indus the plain is comparatively narrow while to the east, and especially to the north-east, the plain covers an enormous area. At Rang Mahal the dried up bed of the river Ghaggar is about 185 metres above sea level, the surrounding area being some 15—25 metres higher.

All the important rivers rise in the mountains that border the desert, but certain small rivers in the plains carry water temporarily during the monsoon seasons. The river Sutlej, the bed of which lies little more than 100 kilometres north of Rang Mahal, is a south-eastern tributary to the Indus. Lakes are very rare in the area; those that do exist mainly hold salt water. During the rainy seasons many small basins and dried up river beds hold water temporarily, e.g. the lower parts of the bed of the Ghaggar near Suratgarh.

The area is situated in the south-east Asian monsoon region. Most of the moisture is carried to the region by monsoons from the Arabian Sea and the Indian Ocean. Precipitation is greatest near the coast and decreases rapidly towards the interior, conditioned by the circulation of air over the desert and by the shallow moist layer of the monsoon, caused by the dry north wind above.[1] Rainfall, which is at its minimum in the centre of the Thar Desert, increases in volume towards the east. This increase is mainly due to the deepening pressure in the area which is caused by the convergence of the monsoon air-streams. S. K. Banerji gives the following simplified description for the theory of the conditions.[2]

"During the winter months under the influence of an anticyclone over Siberia dry north-westerly winds blow over Rajputana. This is occasionally interrupted by the passage of a few depressions from the west during which a few falls of rains occur over the region. The region, however, becomes a big centre of action in the monsoon mechanism, and precisely in playing this role it has become a desert. During the south-west monsoon, we have (1) the highest temperature and the lowest pressure over the Thar Desert, and (2) the highest pressure over the south-Indian Ocean and consequently a pressure gradient between these two regions. The monsoon air

[1] Pramanik, 1952. [2] Banerji, 1952, p. 158.

blows into the country under the influence of this pressure gradient. When the monsoon air has entered into the low pressure area over the Thar Desert, it is already deprived of much of its moisture, because of the rainfall that has already occurred along its long track. A low pressure region is a convergent region and while the monsoon air ascends a few thousand feet in this region and tends to form cloud, extremely dry air from the north-west, which has passed over the north-western mountain range, infuses into the system, and the cloud is dissipated away. We thus get in this region in the summer months almost clear sky, intense insolation, and consequently high temperature, and little or no rain. In a temperature-precipitation diagram, this desert occupies almost the worst position".

The centre of the Thar Desert is by far the driest area of Rajputana, having a mean annual rainfall of about 90—100 mm. Rainfall gradually increases towards the peripheral parts of the desert and the surrounding mountains. Karachi has an annual average rainfall of about 200 mm. and Bikaner, near the centre of Rajputana, receives about 300 mm. annually. The nearest meteorological station to Rang Mahal is Shri Ganganagar, about 70 kilometres to the north. Records kept at this station show that the area has an annual rainfall of about 215—250 mm.; but this figure varies greatly from year to year — sometimes the rainfall is considerably more than this. Outside the desert area the annual rainfall increases to 500 mm. and more.

As we have seen, the intensity and direction of the monsoon is related to the low pressure over the desert. Certain winds in the monsoon period describe a simple path round the centres of low pressure; consequently winds from nearly all directions will blow round such a region, even though there may be a stronger wind from one particular direction

The summer monsoon, which lasts from July to September, is strongest and most pronounced, it blows relatively constantly from the south-west and the west As we have seen it supplies most of the southern parts as well as much of the northern area of the Indus Plain with precipitation — all in a very short period. For the rest of the year the sky is clear with strong insolation, the heat is intensive and the climate extremely arid

During winter when the south-west monsoon has backed and more or less died down, the winds are light and variable. During the winter the winds most commonly come from the north-east and north-west and are sometimes known as the winter monsoon; they occasionally bring rain to the northern parts of the area.

The monsoon rains vary greatly from year to year. During some years no rain or only a few showers can fall on certain parts of the desert The winter snowfall in the mountains is heavy and the melting snow supplies most of the water in the rivers.

The summer temperatures of the Rang Mahal area are normal for the desert, but the temperature in January is comparatively low, sometimes falling below freezing point. The mean January temperature range is about +20° C to +4° C and for May, which is the hottest month, the temperature range is about +42° C to +24° C. The annual mean temperature fluctuates between +33° C to +16.5° C. The season from November to March is "winter", the temperatures are moderate and the winds light and variable. April, May and June are extremely warm months and the population of the area suffers from an extremely harsh climate at this season. During and after the monsoon the temperatures fall and from October onwards more moderate climatic conditions prevail.

Past Climatic Conditions.

Our knowledge of the climatic history of the Indus Plain in Pleistocene and in Recent times is still incomplete. Impressions of the ancient climatic changes of the region must be based on a comparison with changes in other parts of the world, where we have some knowledge of climatic history.

The climatic history of the Post-glacial period, based on the study of the vegetational development chiefly in Northern Europe, has been shown to be more or less valid for the whole world.[1] It is divided into three main climatological phases:

1. Phase of increasing temperature.
2. Climatic Optimum.
3. Decrease in the occurrence of trees which flourish in warm climates, or return of trees predominant today.

This simple division seems to be applicable to large areas of the world. A period of maximum warmth (the Climatic Optimum) existed, according to the pattern of the vegetational development, between 7,000 and 3,000 years ago, and during this period the mean temperature seems to have been a few degrees higher than it is today — at least in the greater part of Europe and certain parts of Asia and America. The Climatic Optimum is a well defined period and has been recorded in both hemispheres. It was generally followed by a somewhat cooler, and in some areas damper, climate.

The climatic cycle outlined above, which is built on the evidence of vegetational history, has been verified in the main by glaciological investigations carried out in the last few decades. These studies have shown, *inter alia*, that variations in the size of existing glaciers and ice sheets, following variations in the climatic conditions, are due to the changes in temperature and circulation of the air.

Ahlmann[2] evaluates the evidence provided by glaciers in indicating climatic fluctuations in the following words: "For the great majority of glaciers there is obviously a greater or lesser lag between the beginning of a climatic fluctuation and the ensuing marginal variations. Hence it is very unlikely that variations in length of a glacier are strictly comparable with short climatic fluctuations, as, for example, an 11-year sun-spot period. The reactions of different glaciers to climatic fluctuations extending over considerable periods — several decades or centuries — may, on the other hand, reach their climax at about the same time, provided that the physiological structures and morphology of the glaciers are not too different".

This theory supports the presumption that it is possible to draw certain limited conclusions concerning climatic variations in southern Asia during the Post-glacial period based on climatic fluctuations recorded in the areas round the Arctic Circle.

The post-glacial climatic changes, as demonstrated by glaciological studies in the northern hemisphere, are illustrated in fig. ~~12~~ 11. The Climatic Optimum is clearly distinguishable and is dated, by the glaciologists, to between 5000 and 1000 B.C. Studies of Swedish peat bogs has shown a great change in the humidity of the atmosphere at least between circa 2300 and 1200 B.C. For some unknown reason a "climate crash" took place in about 500 B.C.; a rapid change brought

[1] von Post, 1944.

[2] Ahlmann, 1953.

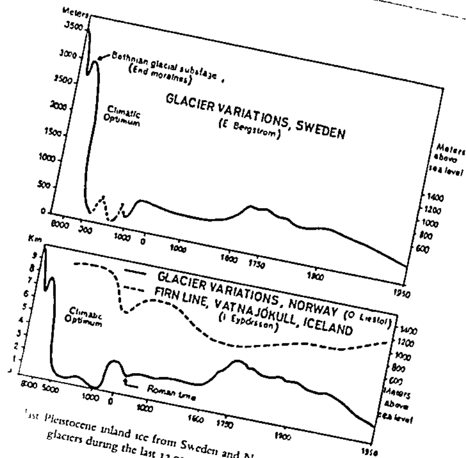


Fig. 4 The reces[...]ast Pleistocene inland ice from Sweden and Norway and the variations of the local Scandinavian glaciers during the last 12 000 years (From Ahlman, 1953)

a cooler, and fo[...] areas, a more humid climate which was then gradually replaced by the climate of toda[...] phs demonstrate that no great climatic changes took place in this area between *circa* 500 B[...] 1600 A.D. In the middle of this period the Rang Mahal culture dominated the Ghagg[...] latively constant climate in the north does not necessarily mean that similar conditions [...] in southern latitudes; the presumption however seems to be reasonable when we [...] all greater climatic changes seem to leave their trace in varying ways throughout t[...]

Geological data [...] st climatic conditions in these areas have been recorded *inter alia* by Hedin[1], Horner[2] [...] Their studies, mainly in Mongolia and East Turkestan, have produced well cor[...] of the comparatively high water level in the rivers and lakes of the lowlands (e.[...] the Tarim basin) and of the relatively humid climate during periods of growing [...] same time these studies have demonstrated the limited water supply and the mor[...] periods, as nowadays, when the glaciers are small or non existant.

We have little inf[...] the post-glacial climate of the mountainous regions of this area. In Kashmir col[...] s deposited during the Climatic Optimum. There are traces of megalithic settlem[...] low, loess-like soil, but it has not been possible to date them;

[1] Hedin, 1907.
[2] Horner, 1932.
[3] Norin, 1932.

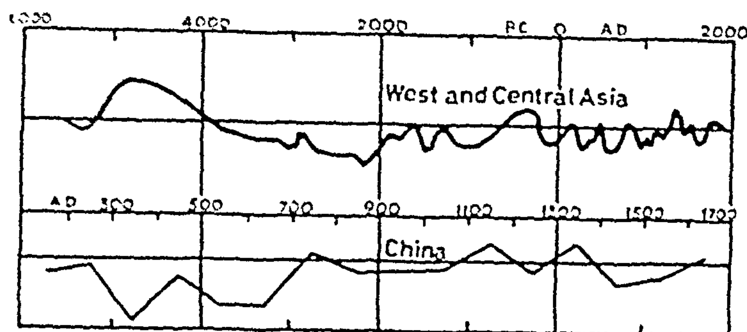


Fig. 5. Variations of rainfall in some parts of Asia during the last 8.000 years. (From Brooks, 1954).

it can only be suggested that the formation of the loess and the initiation of the megalithic settlement took place at some date between 6000 and 2000 B.C.[1] The climate at the period when the loess was formed was probably fairly humid and we certainly know that the water level was high. Since this period the water supply has decreased and the climate has become more arid.

We also have little reliable information about the climate of the early Post-glacial period of the Indus Plain in general, and Rajputana in particular. No special investigations have taken place, but certain information can be gleaned from archaeological excavations in adjacent areas (e.g. at Mohenjo Daro) and from ancient literature, as for example the Rig-Veda Samhita. Arrian's and Plutarch's description of Alexander the Great's Indian campaigns give us a little information. These various sources indicate that between 4000 and 3000 B.C. "the rainfall (was) in excess of present precipitation in Baluchistan and Upper Sind".[2] These areas would then have been partly covered by forests and would have supported a relatively large population. The climate gradually became drier and Baluchistan had become a desert of modern type before Alexander's invasion.

Historical sources increase in number from the beginning of our era and consequently become more useful to climatologists; at the same time the student of climate has at his disposal the results of intensive climatological research carried out in recent years which have produced exact information from certain parts of the world. There is, however, no special survey of the area under consideration and the graphs published here are collations of C. E. Brooks'[3] studies of the climatic changes in the last two millennia in Europe, South-West Asia (Asia Minor and the Caspian area), China and temperate North America.

Brooks' graphs are based on the following evidence:

Records of freezing of coastal waters, sea ice etc.
Advances and retreats of glaciers.
Fluctuations in level of rivers and lakes or inland seas.
Width of tree rings.
Coastal changes, including destruction of towns by storms, advances or (?) quiescence of sand dunes etc.
Settlement or abandonment of sites owing to borderland climatic conditions.

[1] De Terra and Paterson, 1939.
[2] Marshall, 1931.
[3] C. E. Brooks, 1951.

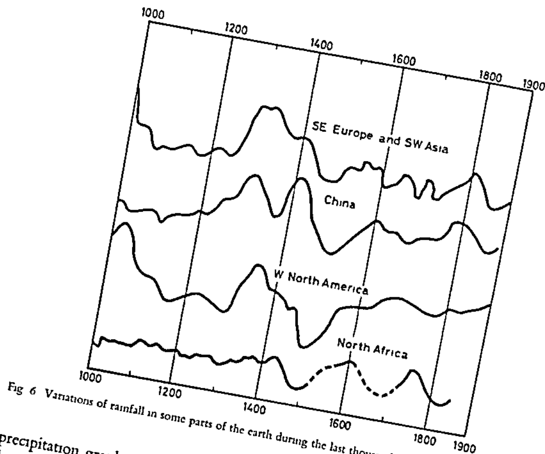


Fig 6 Variations of rainfall in some parts of the earth during the last thousand years (From Brooks, 1954)

The precipitation graphs for these areas mainly show the variations in rainfall and are based primarily on catastrophic floods of rivers and lakes and on movements and migrations of peoples (Table II).

This very limited study of the geological conditions round Rang Mahal does not provide sufficient evidence on which to base conclusions concerning the ancient climatic conditions of the area. It is evident, however, that the oldest dunes of the area (p 10) were formed by fairly strong southerly winds and that these winds continued throughout the earlier stages of the Ghaggar's water-bearing period. Our recent studies show certain changes in water supply and winds in the last millennia; these changes have caused the drying up of the river Ghaggar and the more frequent formation of dunes by northerly winds.

From a paleo-climatic point of view this means that, during the period when the oldest dunes were formed, a more arid climate prevailed in Rajputana than at present; a climate characterized by stronger and drier monsoon winds.

During the latter part, at least, of the Climatic Optimum Rajputana enjoyed a more pluvial climate with more water in the rivers and a larger number of rivers, this climate caused the vegetation to increase and consequently retarded the formation of dunes. The ice in the Himalayas thawed more rapidly during this period (a feature which is reflected in the variation of water levels in Mongolia and Tibet[1]) and the Siwalik Range received considerably more rainfall than it does today. This was probably due to the fact that the area of convergence of the monsoon,

[1] Hedin, Horner, Norin and Huntington

TABLE II.

Climatic Variations during the Christian Era.

A.D.	Europe	Asia	Western North America	Africa
0	As present	Slightly rainier than now	As present	Good Nile floods
100	Somewhat drier	Rainy		Drier
200				
	Rainy			
300		Dry		
			Dry	Rainier
400		Less dry		
		Caspian −15 ft	Dry	Rainy
500	Drier			
		Dry		Rainy
600	Rather dry		Slightly rainier	
		Rainfall increasing		Rainy
700			Drier	Drier
	Dry, warm	Rainy		
800			Dry period ended	Dry
	Rainier	Rainy in China		
900		Caspian +29 ft	Rainier	Rainier
	Drier		Slightly drier	
1000				Drier
	Colder	Dry in China	Very rainy	
1100	Heavy rain	Dry		
		Caspian −14 ft	Dry	Very dry
1200	Rainy	Dry		
	Very stormy	Rainfall inincreasing	Dry	Rainy
1300	Glacial advance, drier	Rainy, Caspian, etc. high	Rainy	Rainy
1400				
	Glacial min.	Dry in China	Dry	Rainy
1500	Oceanic	Rainy, Caspian +16 ft		Rainfall maximum
	Continental			
1600	Rapid advance of glaciers	Rainy	Rainier	Drier
		Caspian +15 ft		
1700	Dry in west	Near present		
	Glacial max.	Caspian rather high		
1800	Cold, rainier		Rainy	
1900	Rapid retreat of glaciers	Caspian falling	Drier	

From Brooks, 1951.

which today is situated to the south-east of the Siwalik Range, was at that time to the north-east of these mountains.

There has been a general lowering of temperature and, in certain areas, an increase of humidity in the northern parts of the northern hemisphere posterior to the Climatic Optimum.

There seems to have been a certain lowering of temperature in the same period in Rajputana. The area has, however, become more arid and the amount of wind-borne sand has increased. Conditions at Rang Mahal would indicate that the dunes are now formed by the winter monsoon instead of the summer monsoon. The driest winds in this area are north-westerly; in an earlier period, however, it seems probable that even the south-westerly monsoon was dry enough, at times, to form dunes.

It is to be noticed that there has been a slight decrease in [illegible]all in some of the typical desert cities of Rajputana, Jacobabad and Hissar for example, in the last 80 years, on the other hand there has been a slight increase in rainfall during the same period in Jodhpur, which is situated closer to the mountains.[1] But as meteorological stations are few and as the monsoon rains are very capricious, the limited material and short period of observation cannot allow any definite conclusions as to the possibility of a general decrease of rainfall in this area.

[1] Banerji, 1952.

THE DRY BED OF THE RIVER GHAGGAR

Some dried up river-beds in north-western India

During the Climatic Optimum, the later part of the Ice Age, and possibly even earlier, a much greater area of the North Indian Plain was watered and drained by rivers which were not only more numerous than they are today but of which some, at least, carried more water. Many of these rivers (now completely or nearly dried up) had, or have, their sources in the outer and lower range of the Himalayas, known as the Siwalik Range (fig. 3). This mountain range together with the Mussoorie Range was, and is still, a very important watershed, for it is here that two of India's largest rivers, the Ganges and the Jumna, have their sources. Both these rivers flow in an easterly direction. The river Sutlej, with its large tributary the Beas, rises higher up in the Himalayas, passing the Siwalik Range on its way westwards to join the Indus.

The rivers Wah, Ghaggar, Saraswati, Chautang and others all rise within a very limited area on the western slopes of the Siwalik Range. This area is bounded to the south by the drainage area of the Jumna and to the north by that of the Sutlej. The first mentioned rivers, only part of which carry water, have never had any connection with the glaciers of the higher levels or with other, larger, catchment areas. Rising in the higher parts of the mountain range (at a height of about fifteen-hundred metres above sea level) the upper courses of these rivers run through steep, narrow gorges. Below the five-hundred metre level, they broaden considerably and gradually peter out further westward, where the head of water diminishes rapidly as the landscape levels out. Below the two-hundred and fifty metre contour the country is almost horizontal with only a slight westward cant.

In that part of the mountain slopes which lies between the five-hundred and two-hundred and fifty metre contours, the existing rivers, insignificant and temporary, flow in narrow channels within enormously wide river beds. A large part of these alluvials was presumably formed during the Climatic Optimum at a time when the monsoon probably provided this area with larger rainfalls.

Below the two-hundred and fifty metre contour the rivers of this type, on the western side of the Siwalik Range, carry water throughout the year; the volume of water however is insignificant and, although the monsoon provides a temporary surplus, the rivers dry out in the desert.

There are today two rivers known as the Chautang. The upper course of the southernmost one runs parallel to, and fairly near, the considerably larger Jumna River; between them lies a slightly developed ridge (probably part of the Aravalli Range), which forms the watershed between the drainage areas of the Indus and the Ganges. They diverge to the north of the town Karnal, where the Jumna turns to the south and the Chautang flows in a south-westerly direction

and on reaching the desert, ceases to carry water. According to a map published by A. Ghosh (1952) it was once, however, a great river which, passing the town of Hissar, turned westwards and eventually joined the then existing river Ghaggar just to the north-east of Rang Mahal.

The other Chautang lies to the west of this river. It carries water along its entire course and passes through the ancient pilgrim town of Kurukshetra to join the larger Saraswati River at the town of Pehowa.

The upper course of the Saraswati (which is also known as the Markanda) carries water only during the monsoon period, but below the two-hundred and fifty metre contour part of it carries water throughout the year. It flows mainly in a northeast — south-west direction, probably as a result of the northerly ridges of the Aravallis which serve as watersheds in these areas. A few kilometres to the south-east of the small town, Shatrana, it joins the Ghaggar River which runs southwards.

In the same way the river Ghaggar carries water only temporarily in its upper courses, whilst below the two-hundred and sixty metre contour part of it carries water all the year round. The Ghaggar rises near the town of Kalka, passes to the west of the town of Ambala, is joined by a large number of tributaries and merges in the somewhat larger Saraswati River near the two-hundred and thirty metre contour. This joint river retains the name Ghaggar as it meanders westwards through the flat, dry, hot and sterile desert. Today it dries up a few kilometres to the north-west of the town of Sirsa. The distance between the confluence of the two rivers and Sirsa is about a hundred kilometres, as the crow flies, the real length of the river being several times that distance. In this distance the river falls only about twenty-five metres, a slope of only 0.02 per mille. The pronounced meanderings of the river, with the consequent tendency to change its bed, results from the level nature of the country through which it flows. These far-flung level areas have been, and still are, very susceptible to widespread floods especially from the waters of the Sutlej, as they are easily invaded by water, which forms large lakes. To judge from the sedimental layers the area has been flooded on many occasions in the past. These areas, which are today completely dried out, are now, to an increasing extent, being invaded by dunes, a process facilitated by the sparse vegetation.

The dry bed of the Ghaggar continues from Sirsa in a westerly direction, turning south-westwards at Hanumangarh. According to certain maps a larger tributary, known as the Wah, at one time joined the Ghaggar from east-north-east at Hanumangarh. The upper courses of this erstwhile tributary are only temporarily water-bearing above the two-hundred and seventy metre contour, below this level it carries water throughout the year. It runs parallel with the Ghaggar and dries up in the desert one hundred and sixty kilometres east-north-east of Hanumangarh.

The gradient of the well defined river-bed between Hanumangarh and Suratgarh (a distance of some fifty kilometres) is less than about 0.7 per mille while between Suratgarh and Anupgarh (about seventy kilometres) its gradient is only about 0.03 per mille. Modern irrigation canals have been dug in the old river-bed, in which the water from Ghaggar and Sutlej flows.

The Chautang at one time joined the Ghaggar to the east of Suratgarh, while the Naiwal joined it to the west of Anupgarh on the Pakistan border. At this point the Ghaggar changes its name to "Hakra".

South of Marijgarh the Ghaggar-Hakra at one time continued westwards to join the Sutlej near the present confluence of this river with the Indus. At another time it turned southwards and, running almost parallel with the Sutlej-Indus, had its outlet in the Rann of Cutch, to the east of the present mouth of the Indus. In the latter case, the Sutlej (or Indus-Sutlej) had, for various reasons, taken a more easterly course, receiving the Hakra as a tributary. This river-bed still carries water in its lower courses and is called the Narra (fig. 3).

The size of the bed of the Ghaggar in all its parts, where it carries water or where it is dry, is extremely large when we consider the amount of water which flows in it today — and this also applies to the tributaries. This feature seems especially pronounced in the extremely flat areas between Sirsa and Marijgarh where the Ghaggar was joined by most of its tributaries. The topography of this area was such that it could easily be reached by the flood water of the Sutlej and was also favourable for the formation of large lakes in the periods of flooding. Our knowledge of the complicated and fascinating history of these, now mostly dry, desert rivers is only fragmentary. The problems they raised were ably treated by C. F. OLDHAM (1874 and 1893) and R. D. OLDHAM (1886) who based an acceptable theory on the available data in a clear manner. Some of the most important sources of this data are a number of the Holy Books of India and the local traditions of the areas concerned. During recent years observations in the field and archaeological excavation have contributed fresh evidence towards the solution of the problem (A. GHOSH, 1952).

In his paper "The Saraswati and the Lost Rivers of the Indian Desert" C. F. OLDHAM (1893), basing his arguments on the evidence provided by certain Holy Books, shows that the Saraswati was the greatest river (and also the holy river). When, in its lower courses, the Saraswati joined the Ghaggar for some unknown reason it took over the name as well, despite the fact that it was, and is, the larger and more important of the two.

The reasons why the Saraswati "lost itself in the sand" are discussed by OLDHAM (p. 52) as follows:

"The view held by several writers on the subject appears to be that it was owing to a shrinking of the stream caused by diminished rainfall.

This, however, could not possibly have been the cause. It would have involved the existence, previously, of such meteorological conditions as must have rendered the holy land of the Brahamans an uninhabitable swamp. The neighbouring large rivers, too, must in such a case have been vast in proportion. This, as their channels show, they were not. Some of them, in fact, which are mentioned in the Vedas as being fordable, are so with difficulty at the present day. In addition to this we find, from the hymns of the Rig Veda that instead of the rainfall being in excess, relief from drought was most frequently prayed for, and that Indra 'gave rain to the sacrificer' (iv. 26.2).

According to the Aitareya Brahmana (II. 19) the country at some distance from the river was even then desert...

We should remember that the Saraswati, Ghaggar and their tributaries, must, from the earliest times, have contained but little water except in the rainy season. Their sources being in the outer and lower Himalayan range, they fed by rain only: and not by the melting snows also, as are all the great rivers of Northern India. The collecting grounds of these streams, too, is, and always must have been, limited, as it lies between the Sutlej and Jumna valleys.

Some diminution in the volume of these rivers has probably taken place, during the lapse of ages, from destruction of forests and increased irrigation.

There is nothing, however, in history to show that they ever contained much more water than they do now; indeed all records that have come down to us point to the contrary.

The rainfall can never have been considerable on the outskirts of the desert of Maru.

It was not, then, owing to the shrinking of its stream that the waters of the Saraswati lost themselves in the sand, instead of flowing onwards to the ocean. Its ancient course, however, is continuous with the dry bed of a great river, which, as local legends assert, once flowed through the desert to the sea.

In confirmation of these traditions, the channel referred to, which is called Hakra or Sotra, can be traced through the Bikanir and Bhawulpur states into Sind, and thence onwards to the Rann of Kach. …

What then was this lost river? Where did it rise? And whither has it gone?

The waters of the Saraswati, the Ghaggar, and their tributaries, for the reasons already given, could never have maintained a river of such magnitude. It must be remembered, too, that the greater part of the long course of the Hakra was through a thirsty and nearly rainless region, in which it did not receive a single feeder

Between the Sutlej and the Jumna there is no opening of the Himalayas through which a large river could have entered the plains".

After this OLDHAM discusses the possibilities that the Sutlej and the Jumna might, as a result of a change of course, have flowed into one or more of the channels which are now almost, or completely, dry. He points out the possibility that the Jumna might at some period have flowed westwards, instead of eastwards, from a point near its source; but there is no indication, in the literature, that this happened. It seems improbable that changes in the course of the Jumna below this point could have supplied the Saraswati with water as: "It seems, further, that no change in the course of the Jumna can have carried off the waters of the Hakra, which, indeed, according to tradition, was a flowing stream after the time of the Moslem invasion

As regards the Sutlej, however, there is evidence of changes quite sufficient to explain the disappearance of the Saraswati in the sands, the drying up of the Hakra; and the transformation of a once fertile region into desert.

There can be little doubt that this river, instead of turning nearly due west on leaving the hills, as at present, anciently took a more southerly direction and that the Hakra is its former bed.

It would seem that the Sutlej has changed its course from time to time until at last it joined the Beas and the two streams flowed in the same channel".

The decisive importance of the Sutlej is stressed and "until Mahommedan times, the Sutlej flowed in the Hakra channel, and that, till then the country upon its banks was fertile and populous.

The Hakra is formed by the union, near Wallur, on the borders of Bikanir and Bhawulpur, of two large branches. Each of these arises from the junction of several channels, most of them dry, or only containing a little water in the rainy season. In some of them, however, streams still flow for some distance

Of these old river-beds, the breadth of which varies from one to five or six miles, those towards

the east meet near Bhatnair to form the eastern arm of the Hakra. They are called in our maps Ghaggar, and Wah, Sonamwal or Sirhind Nadi.

The western arm of the Hakra is formed by three branches, each of which is known as Naiwal. These meet near Kurrulwala (Lat. 29°33′, Long. 73°52′).

All these old channels diverge from the direction of Rupur, where the Sutlej enters the plains, and each is said to have been in turn the bed of that river. On the banks of each are towns, which though now more or less decayed were once places of importance."

OLDHAM then discusses the different periods at which the Sutlej flowed in the different river-beds, and presents some probable dates derived from ancient literature. Concerning the drying-up of the Ghaggar he says (p. 59): "When the Sutlej changed its course to the westward, and abandoned the eastern arm of the Hakra, the Saraswati, which had been a tributary, was left in possession of the deserted channel, in the sands of which its waters were swallowed up.

It is of course impossible to fix any period for this change, but it may be presumed that it took place between the Vedic period and that of Manu, when we first hear of the disappearance of the Saraswati in the sands."

The paper concludes with the presentation of various alternative theories concerning the changes in the Indus and its western tributaries.

As has been mentioned above, the upper courses of the rivers only carry water during the monsoon periods, and this has been the case since the last Ice Age at least. The very wide river-beds, which are today almost dry, were formed by considerably wetter periods of rain than those that occur during the present monsoon rains in the Siwalik Range.

As the lower courses of these rivers (below the two-hundred and fifty to two-hundred and seventy metre contour) carry water throughout the year, it is clear that they cannot rely only on the rainfall for their supply of water. Some of their water must have its origin in the subsoil. Judging by the general topography (see the map mentioned above) this probably consists of a more or less static water table, in the alluvium, which receives most of its water from the Siwalik Range. During the Climatic Optimum, when the ice in the Himalayas thawed extensively and when the rainfall was probably considerably greater in these areas, this water table was presumably higher, or at any rate capable of giving more water — such conditions would provide these rivers with a more constant flow.

During the last phase of the Ice Age and the beginning of the Post-glacial period, when the recessions of the Himalayan glaciers took place, there was probably more rain in parts of the Indus Plain than at present and the hydrographical conditions were therefore somewhat different. The most important changes which have taken place since then have been a lowering of the water table, a reduced number of lakes and rivers, changes in the courses of the rivers and, as a result, a more arid climate. These changes have made themselves felt especially in the desert areas and on and along the outer and lower ranges of the Himalayas.

Evidence of a marked reduction in the water supply of certain rivers, which was felt particularly during the centuries about the Birth of Christ, can be gained from our knowledge of the past climatic and hydrological conditions mentioned in the two religious documents known as the Rig Veda (just down in writing some time between the years 1000 and 600 B.C.) and the Mahabharata (compiled in the period about the Birth of Christ) and from other historical and archaeo-

logical sources (Oldham 1893). It seems reasonable, therefore, to connect this change with the climatic change which took place during the first millennium B.C. following the warm Post-glacial period which resulted, especially in the north, in marked variations in the climate The effect of the warm Post-glacial period on the climate of the Rajputana Desert continues to be obscure. The changes which took place after the warm Post-glacial period are also difficult to trace but a certain amount of evidence has been provided by both archaeology and geology

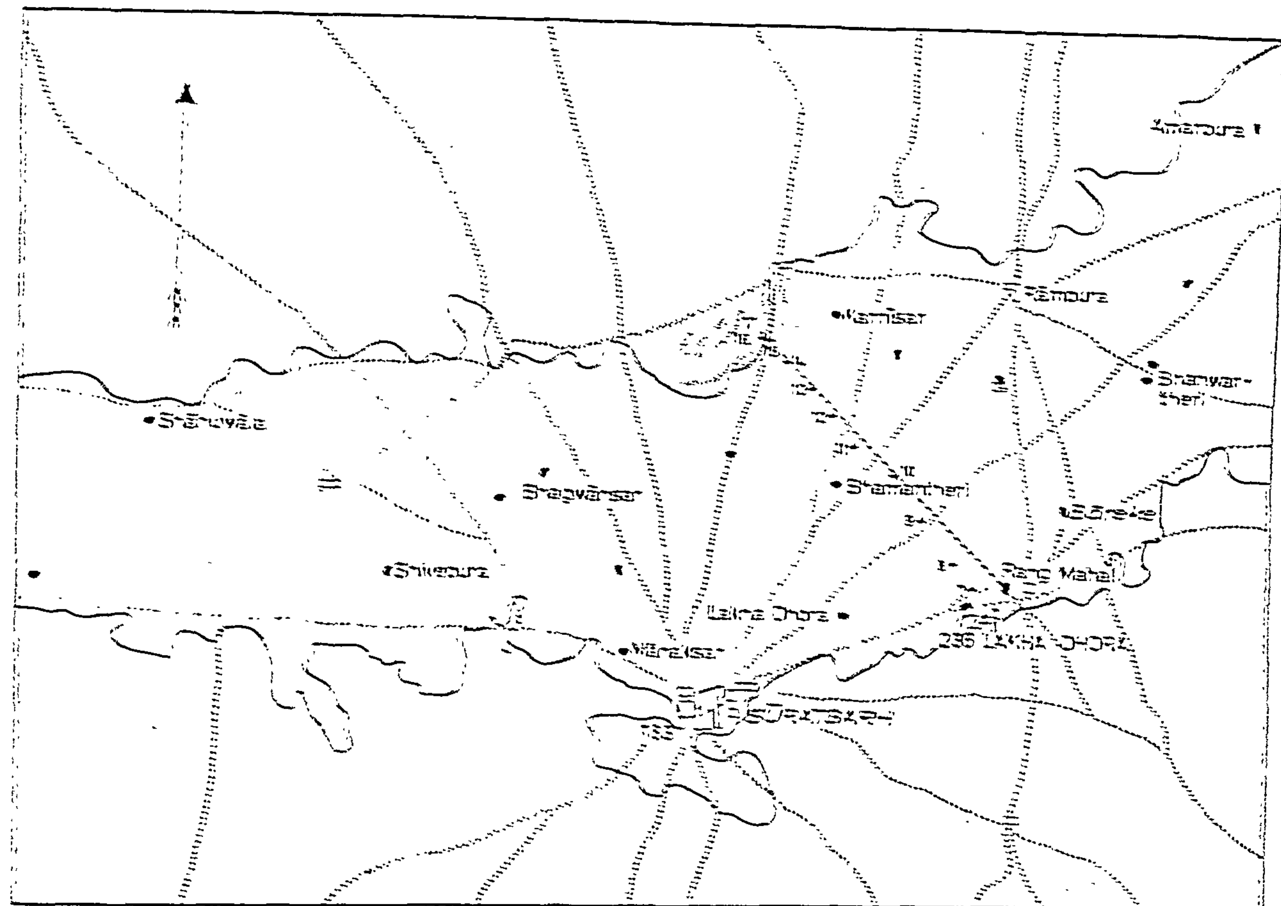
It seems very probable that the warm Post-glacial period influenced the climate of these areas, as it has been proved that it affected, with varying intensity, the climate of the entire world As a working hypothesis we may presume that the slightly higher temperature of the Climatic Optimum resulted in a climate of "blocking" type, i.e. a climate where more irregular wind conditions than normal produce a cyclonic path of an irregular and "wavy" shape, in place of a seemingly normal east-west direction. This "wavy" formation resulted in a brisker exchange of air between the poles and the tropics. It was probably this cyclonic system which was ultimately responsible for the melting of the ice-sheet.

One of the results of the higher temperature in South Asia was that the monsoon could carry more water, which would then fall in the mountains. This increased rainfall, therefore, would be the main reason for the large number of rivers in this area, and for their size The increased rainfall and the higher temperature also resulted in intensified melting of the glaciers, with violent spring floods and consequent changes in the river-beds, as a result of the increased accumulation of sediment on the plain below.

There is no doubt that water from the mountains was chiefly responsible for the filling of rivers which are now dry. Oldham has stated that water was periodically supplied to the Ghaggar, Wah, Naiwal and the other north-eastern tributaries of the Ghaggar, by changes in the bed of the Sutlej. From a point as high in its course as the foot of the Siwalik Range the Sutlej could have flowed into, and created, these mighty river-beds, which today carry smaller amounts of water or are completely dry. This theory can perhaps be applied to those rivers (e g the Wah) which are closest to the Sutlej, but this explanation cannot be valid for the other rivers. The large volume of water flowing through the upper courses of these rivers came from the monsoon rains and the increased melting of snow and ice may have raised the water table. But the changes in the course and the floods of the Sutlej (which received most of its water from the inner Himalayas) in the areas to the north of Sirsa and Hanumangarh, played an important part in the continued existence of the Ghaggar in its western and lower courses towards the Rann of Cutch Evidence for this is found in the numerous, very wide, tributaries of the Ghaggar in these areas, in the flat topography and in the distribution of the clay sediments. The extreme flatness of the area promoted the formation of lakes in which the abundant silt from the rivers settled and eventually filled the river-bed; it was sometimes necessary, therefore, for new spring floods to scour out another course. It is possible that the rotation of the earth played a certain part in forming the changes of the course of the Sutlej, as this phenomenon produces an inclination to the right.

The Ghaggar-Bed at Rang Mahal.

The dry river-bed at Rang Mahal is today about seven kilometres wide. It is almost completely level save where it is interrupted by a number of sand dunes, a few trees and bushes, a number of



• Old settlement. Modern village. Camel-route. 238 Height in metres above mean sea level.
Area covered by eolian sediments. Sample pit. 0 5 Kilometres.

Fig. 7. The immediate vicinity of Rang Mahal.

old abandoned settlement sites, which form tells, and a number of modern villages. Along the banks are sand dunes (fig. 8 and 9).

In order to investigate the sequence of the layers of sediment in the Ghaggar and, if possible, to estimate the date at which the Ghaggar ceased to carry water, a number of trial pits were dug into the river-bed in a north-westerly direction along a line from Rang Mahal to a point south of the village Kamisar on the northern bank (fig. 7). The distance between each pit was about seven-hundred metres, this was reduced to two-hundred metres close to the bank. The pits were about one metre square and about five metres deep: the workmen, who were otherwise both willing and efficient, refused to dig deeper as they feared that the sides would collaps (although they seemed to be quite firm). In some of the pits, however, where the bottom layer consisted of sand, it was possible to increase the depth by boring by hand.

In these pits the sequence of the sediment layers was measured, and a soil sample collected every five centimetres.

The stratigraphy exhibits alternating layers of fluvial and eolian sediment. The upper six to

seven metres of the Ghaggar bed can be divided into six stages, three fluvial and three eolian (fig. 9). By fluvial sediments is meant clay and clay mixed with silt and fine sand, eolian sediments are taken to consist of sand and dust.

1. Beneath five and a half to six metres below the present surface of the Ghaggar there are fluvial deposits of unknown thickness. This horizon was found, in the course of drilling, in the southern part of the river-bed. It was not found in the northern part of the bed — this may, however, be due to an incomplete investigation, as it proved difficult to break through the hard clay deposits above it.

2. Above this fluvial deposit was a layer of eolian sand which varied in thickness and distribution. This layer was found in all the pits except two (nos. 12 and 14), where it proved impossible to break through the overlaying hard clay deposits (fig. 10). This layer of sand consists of the dunes, which at one time formed the banks of the river, of an extensive elongated dune in the centre of the river (pit no. 11) and of a number of smaller dunes of varying sizes. This layer was formed during an intensely dry period which was probably of fairly long duration. The greater part of the river-bed was covered by dunes, and the river-water (if indeed there was any water in it at all) flowed in minor arms on either side of the large dune in the middle of the bed. Certain basins, however, held the water from the monsoon rains and in these places clay and silt formed the so called "playa" sediments. The deposits of sand seem to be more plentiful in the southern part of the river as compared with the thin sand covering of the northern area. This fact indicates that the dunes invaded the area from the south, and were formed by the south-westerly monsoon winds.

It seems very probable that the large settlement, known as Bhamantheri, was built on the large sand dune, which ran for a considerable distance along the centre of the river-bed. In the same way the first settlers at Rang Mahal, as will be described below, used one of the similar dunes which formed the bank of the Ghaggar.

The sand deposited in the area is very rich in mica and is of such a loose consistency that it was impossible to drill through it with a handraised post hole auger as the walls of the hole would *immediately collapse In certain borings, however, the upper part of the layer was found to be* firm as a result of cementing by the rainwater and the salts from the clay deposits above.

3. During the second fluvial stage, the Ghaggar retained two well developed river channels separated by the large dune in the middle of the bed. It is possible that, initially at least, the northern branch was the deeper of the two and carried most water, for the smaller amount of sand deposited here would offer less resistence during the early part of this stage.

The deposits of this stage vary in thickness between one and one and a half metres, and there is no evidence of any sustained dry periods as only very few marked levels can be distinguished in the homogeneous sequence. Very little eolian sand can be detected, the sediments consisting almost entirely of clay A characteristic feature is the covering of clay particles by different calcium salts, of which gypsum is the most common. These grains sometimes form separate layers alternating with clay (pit no. 9).

The upper limit of this deposit lies about three and a half metres below the present ground-surface, and it would *seem that the bed of the river was relatively level at this period.*

It is possible that the earliest evidence of settlement in this area found during our excavations

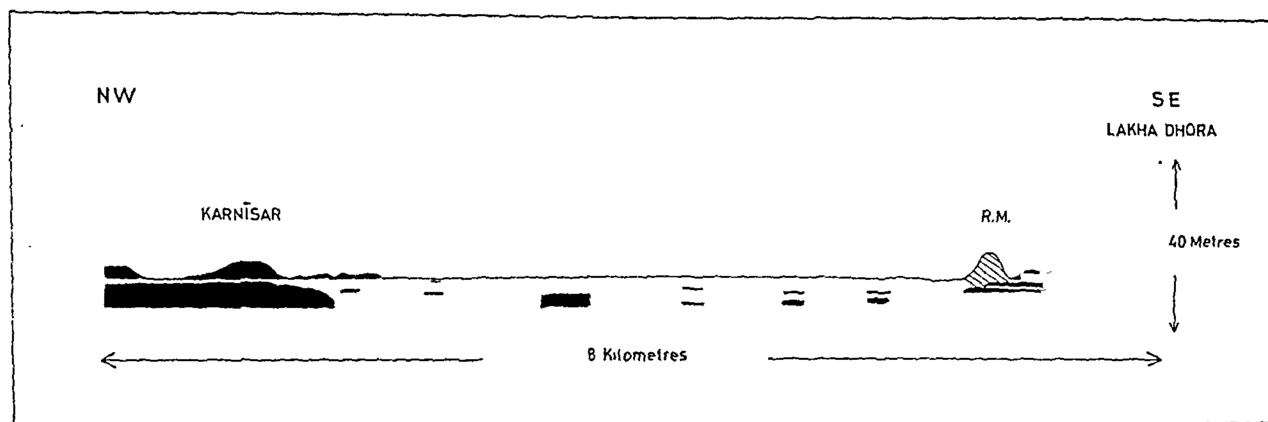


Fig. 9. Cross section through the dry bed of the river Ghaggar showing the eolian sand deposits (black area). The direction of the section is marked on fig. 7.

— a potsherd of red ware found at a depth of almost four metres in pit no. 9 — belongs to this fluvial stage. Unfortunately the author was not present at the site at the moment when this piece was discovered and the workman was unable to point out its exact find-spot with certainty; so it is possible that the depth to which it is attributed is a little incorrect. We can therefore not exclude the possibility that this sherd belongs to another find which was made a few decimetres higher in the sequence cf. fig. 14 and the note on p. 49.

4. The following dry stage can be seen in almost all the pits as a layer of eolian sand, a few decimetres thick — only in the centre of the river-bed (pits nos. 10 and 12) is this sand layer missing. The upper part of the large dune (seen in pit no. 9) was flooded at the end of the previous fluvial stage, clearly marked in the sequence by a distinct horizon, above which a layer of sand, a few decimetres thick, was deposited. Traces of the tunneling of snakes and lizards in this horizon indicate the favourable climatic conditions for these reptiles during this stage.

As this sand layer is thickest in the southern part of the river-bed, it seems that the dunes were still formed by south-westerly winds.

Pottery from this stage was found at a depth of three and a half metres and is contemporary with the first settlement at Rang Mahal; it is probably to be associated with the nearby village of Bhamantheri. The find will be described below.

5. After this eolian stage, the Ghaggar took the form of a single river-bed carrying a relatively constant flow of water which resulted in fairly extensive deposits of sediment: the invasion of dunes from the south ceased.

During the early part of this stage the supply of water seems to have been limited, to judge from the large amount of eolian sand occurring in the sediments. It is possible that very strong winds carried the sand out over the water, but as the sand often occurs in small nodules, it is most probable that it was carried there under dry conditions. The early part of this stage ended with the first flood recorded by our investigations, which took place at a time when the river-bed was about two and a half metres below the present surface level. Evidence for this flood is provided by, for instance, a layer of clay (10 cms. thick) at the foot of Lakha Dhora and a zone of iron-oxide veins on the northern bank. This flood was followed by an extremely dry period resulting

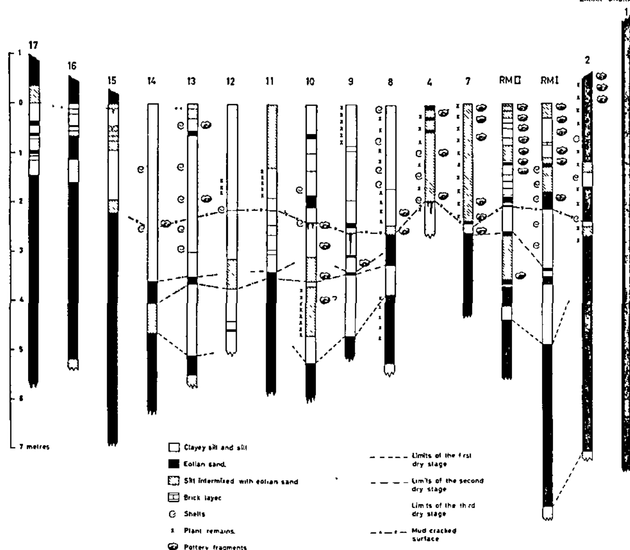


Fig 10 The sediments of the dug and drilled pits in the dry bed of the river Ghaggar Their position is marked on fig 7

among other things in very deep cracks in the river-bed and an accumulation of various kinds of shells. Many traces of settlement were found in this dry crust and will be discussed below. The eolian sand deposits of this dry period are found only along the banks of the river. This dry period has not been recorded as a separate stratigraphical stage.

The dry phase ended suddenly and was followed by a fluvial phase during which the Ghaggar flooded the surrounding areas and became more like a lake than a river during the high water periods. The various floods left large amounts of clay sediments in which occasionally signs of current bedding can be seen. During some of the dry periods eolian sand was deposited on the river-bed in the shape of small, low dunes.

One flood, or period of floods, in particular must have been disastrous to the nearby settlements. On this occasion a layer of clay (30 cms. thick) was deposited on the slopes of Lakha Dhora (fig. 10).

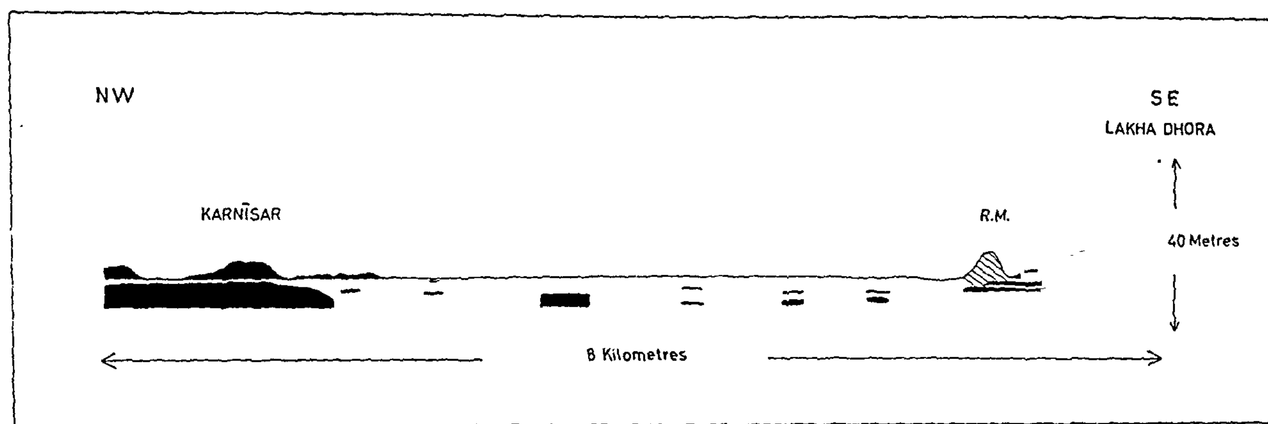


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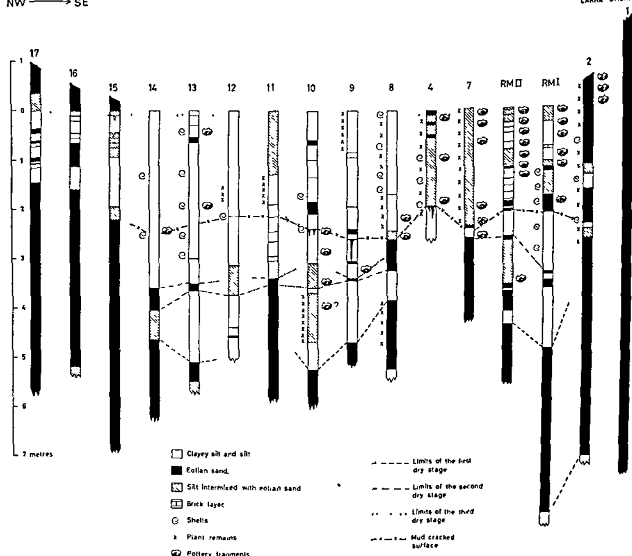


Fig 10 The sediments of the dug and drilled pits in the dry bed of the river Ghaggar Their position is marked on fig 7

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One flood, or period of floods, in particular must have been disastrous to the nearby settlements. On this occasion a layer of clay (30 cms thick) was deposited on the slopes of Lakha Dhora (fig. 10).

This event took place relatively early in the fluvial phase and seems to have been the reason for the discontinuation of the second stage of settlement at Rang Mahal (strata no. 17—18, fig. 10). The Ghaggar expanded over a considerable area during this flood, and this is especially noticable to the north, where the clay sediments can be followed for several hundred metres to the north of the present bank. The sediments are today covered, for the most part, by dunes, but between the dunes small basins can be found, the bottoms of which consist of clay sediment from this flood.

Shells occur frequently in the sediments of this period and are especially numerous in those levels which indicate dry phases. The most common species are *Pila globosa*, *Viviparus bengalensis*, *Planorbis exustus* and some *Bithynia* species, which are not more closely identified. All of them seem to be purely aquatic types, although *Pila* can survive, to a certain extent, in dry conditions.

A large amount of roots is preserved in the riparian zones. This was also the case during the second fluvial stage, when vegetable remains were plentiful in the dunes nearest to the banks.

An attempt to find diatoms in these sediments gave no positive result. The primary settlement of Rang Mahal took place during the later part of this stage and continued during some decades after the Ghaggar had ceased to carry water.

6. The fluvial stage was replaced by the dry conditions pertaining today. Nowadays the invasion of the dunes seems to come, in the main, from the north — if it is possible to judge from the evidence afforded by this limited area.

The Drying up of the Ghaggar at Rang Mahal. The sequence of strata described above provides incontrovertible evidence that the bed of the Ghaggar, in the period under discussion, was sometimes more or less dry and at other times full of running water. The fluvatile periods occurred either as the result of exceptionally rainy periods in the Siwalik Range, as a result of which the water in the bed of the Ghaggar and its tributaries extended much further westwards than it does nowadays, or during periods when the Sutlej overflowed its banks and entered the bed of the Ghaggar and other river beds (fig. 3). The final drying up of the Ghaggar at Rang Mahal, as we can see from the series of sedimental layers, was the last stage in a sequence of periods during which the amount of water in the river bed gradually decreased. The exact dating of this occurrence is not as yet known, but it can be dated in general terms. Nowadays the bed of the Ghaggar is only covered at the peak of the monsoon rains, and even when this happens the water is only a couple of decimeters deep. As the bed of the Ghaggar in the Rang Mahal region hardly slopes at all the water is almost stagnant and in certain comparatively small areas forms temporary lakes, analogous in type to "playa" lakes. The accumulation of clastic sediments is insignificant if we ignore the wind-blown sand-dunes. The monsoon rains bring a number of salts to the area and these crystallize out in certain places during the dry season.

Oldham (1893, p. 59) has discussed the drying up of this part of the Ghaggar and puts forward the theory, based partly on historical tradition and partly on certain legends, that the Ghaggar became disconnected from the Sutlej "between the Vedic time and that of Manu". However neither "the Vedic time" nor "the time of Manu" can be used for dating, as they represent long and relatively undefined periods of time.

The geological investigations have produced no direct evidence to date the drying up of the

river. Both the archaeological finds and certain climatological features, however, indicate that the Ghaggar, in the area under discussion, did not carry water as a river, after the middle of the sixth century A.D. For example the fact that Rang Mahal was deserted as a settlement site must in some way be connected with the drying up of the Ghaggar. The archaeological excavations have shown that Rang Mahal was inhabited in the first half of the first millennium A.D. and the geological investigations have shown that the Ghaggar became dry during the latter part of the period of settlement (cf. the chapter "The Mound of Rang Mahal"). The final drying up of the Ghaggar must have taken place at some time during the sixth century A.D.

The Ghaggar, as we have suggested, carried water temporarily for some time before it finally dried up. There seems, however, to have been a fair amount of water available in the river bed itself up to the end of the period of habitation, judging from the fragments of grains of rice, straw and chaff which were found in almost every layer of the mound and which were especially plentiful in the topmost layers (cf. p. 79).

Certain climatological data also indicate that the settlement sites in this area were presumably deserted in the last years of the sixth century. The climate in the Near East from about 850 B.C. to about 700 A.D. was approximately the same as that which pertains to-day, although it may have been somewhat drier. Between 590 A.D. and 645 A D. a very marked dry period occurred which caused migrations of peoples in this part of the world; this dry period was especially marked in those areas which, even in more normal climatic conditions, had a scanty or insufficient water supply.[1] This exceptionally dry climate presumably pertained in N W India, or at least affected the climate there, and at the same time influenced the lives of the peoples in that area, and especially those living in the deserts Such a long and extremely dry period as this must have caused a diminution in the water supply of the Ghaggar, which was at that time completely dependent on the monsoon rains; this diminution may have been so considerable that it became impossible to maintain a water supply there all the year round If we also consider the growing sterility of the area, which resulted in a shortage of food for the cattle, it becomes clear that it would be out of the question for permanent inhabitants to live there. This dry period therefore was probably responsible for the desertion of Rang Mahal and possibly even of other sites in the same area; the inhabitants presumably moving on in search of less dry areas.

On the Texture, Structure and Mineralogy of the Fluviatile Sediments.

The bed of the river Ghaggar is built up, as we have seen, partly of silt and clay sediments, carried there mainly by flood water, and partly by sediments deposited by eolian action In the Rang Mahal district the bed of the river Ghaggar received water sometimes from the Ghaggar and its tributaries and at other times from the Sutlej, which at one time followed a more southerly course than at present. Between flooding, dry periods of varying length occurred and during these periods the river bed dried up and was invaded by drift sand.

It is outside the scope of this publication to make a thoroughly detailed examination of the structure, texture and mineralogy of these river sediments; but a few examples will be presented to throw light on their general composition

[1] Butzer, *Erdkunde*, 1957



Fig. 11. Photo of a typical river-sediment (clay and eolian sand).

The granulometric composition of the samples of sediment was analysed by means of the pipette method described by G. W. Robinson and others: a method based on Odén's theory of mechanical analysis. An 0.01 normal sodium oxalate solution was used as peptising agent. The samples were not decalcified before the analysis.

Sample no. 6 was collected at a depth of 240.cms. in pit no. 8. It came from the layer of clay which was situated immediately below the level of the deep cracks caused by the drying up of the river bed (p. 30f.). The sediment is of a brownish-orange colour and was deposited during the first period of flooding, when water-borne layers were deposited at the foot of Lakha Dhora (p. 30).

Sample no. 7 was collected at a depth of 190 cms. in pit no. 4 immediately above the level of cracks. The colour of the sediment is brownish-orange and it was deposited during the second great period of flooding (p. 31).

Sample no. 8 was collected at a depth of 150 cms. in pit no. 15. This sample consists of a mixture of fluvial and eolian sediments deposited during a period when the Ghaggar had a normal water level during the monsoon but was dry in the intervening seasons. The colour of this sediment is brown/yellowish-orange.

Sample no. 9 came from a depth of about 70 cms. in pit no. 8. This layer has a brownish-orange colour and is very rich in shell and plant fragments. The sediment seems to have been deposited during a fairly normal period of alternating monsoon and dry seasons.

TABLE III

Size frequency distributions of samples from the dry bed of the river Ghaggar at Rang Mahal, Bikaner The grain diameter is measured in microns (μ)

Sample no	<0 24— 0 24μ	0 24— 0 49	0 49— 0 98	0 98— 1 95	1.95— 3 9	3 9— 7 8	7 8— 15 6	15 6— 31 2	31 2— 62 5	62 5— <62 5μ
6	6 04	2 34	10 89	9 34	11,63	9 93	10 71	9 61	9 20	20 28
7	13 63	12 53	10 43	14 55	16 20	13 80	7 50	3 80	7 32	0 4
8		1 78	5 99	6 49	7 95	11 34	25 06	32 02	6 58	2 74
9	10 4	7 46	6 77	9 34	10 62	12 77	16 66	12 45	5 67	7 78
10	4 25	3 42	0 82	3 70	1 64	7 40	1 10	0 96	1 64	75 05

Sample no. 10 was collected at a depth of 450 cms. in pit no 13. The layer is orange/brown in colour and is rich in small grains which are covered by various calcium salts, and especially by gypsum. These gypsum grains occasionally form horizontal streaks. This sediment, which belongs to the second fluvial stage, was probably deposited during a period of normal water conditions in the river.

The analyses in table III and in the diagram, fig. 11, show that the distribution of the grain sizes of the fluvial material is fairly heterogeneous and falls into no definite groups. This is partly due to the varying degrees of admixture with eolian sediments.

In order to obtain information concerning the general mineralogical composition of the finest granular sediments round Rang Mahal certain samples were analysed by X-ray diffraction. The samples were taken at three different levels of pit no. 9, which is situated roughly in the middle of the bed of the Ghaggar (fig. 7). Samples from the same pit were analysed in respect to their soluble salt content (p. 37 f.).

The following proceeding was used in the X—ray investigation. The isolated fraction of grain (size less than 2 microns) was X-rayed a) in the natural state; b) after treatment with glycerol; c) after decalcification by digestion with 0.1n HCl for 15 minutes at 50° C; d) after heating at about 550° C; e) after digestion of the natural clay with 4n HCl at boiling heat for 30 minutes.

Sample 493 in pit no. 9 was taken at a depth of 470 cms.; it was deposited during the first fluvial stage (p 29 f.). The following minerals have been identified: chlorite, montmorillonite, muscovite (illite), quartz, calcite, felspar, and hornblende. It seems probable that there is also some kaolinite.

Sample 446 was taken at a depth of 235 cms.; it was deposited during the third fluvial stage, immediately above the mud-cracked surface This sample is of the same mineralogical composition as the one above save that kaolinite does not occur, or is only present in negligible quantities.

Sample 410 was taken at a depth of 55 cms and represents a stage at which the water supply in the Ghaggar was definitely diminishing The sample consists mainly of quartz, felspar, and hornblende with smaller quantities of mica and chlorite minerals.

TABLE IV

X-Ray Diffraction Patterns of Clay from the Dry Bed of the Ghaggar.

	Sample 493						Sample 446						Sample 410					
	Nat.		Treated with 4n HCl		Heated to 600° 30 min.		Nat.		Treated with 4n HCl		Heated to 500° 30 min.		Nat.		Treated with 4n HCl		Heated to 600° 30 min.	
I	14	m			14	w							13	mw			13	mw
Ib	19	ms					19	mst			14	w	14	mw				
2	10	m	9,9	w	11,3 9,8 } Bd	w	10	mw	9,8	mw	12	w	9,9	mw	9,9	mw	9,8	mw
2b							10	mst					9,8					
3							7	w			7	w		st				
3b	8	w					7	m					8,2	w				
4	7	m	7,3	w									7,1	mw				
4b													7,2	m				
5									6,4	w			6,3	w	6,4	w		
5b	6,5	w																
6			5,7	w	5,6	w			5,6	w	5,7	w	5,7	w				
7	5,0	w	5,0	w	5,0	m	4,95	w	4,98	w	4,98	w	5,0	w	5,0	w	5,0	mw
7b	5,0	m					4,96	mw					5,0	m				
8															4,7	w	4,7	w
8b	4,8	m					4,7	mw					4,8	mw				
9	4,5	st	4,5	m	4,5	m	4,5	mw	4,5	mw	4,5	mw	4,5	m	4,4	mw	4,5	mw
10	4,2	m	4,2	m	4,2	m	4,25	m	4,25	m	4,25	mw	4,2	mst	4,2	m	4,2	m
10b	4,2	w																
11	3,9	w	4,0	m	4,0	w	3,7	m	3,7	m	3,7	m	4,0	w	4,0	w	4,0	w
12	3,7	w	3,7	m	3,7	m	3,5	w	3,5	w	3,5	w	3,7	mw	3,7	m	3,7	m
12b													3,6	mst				
13	3,5	w	3,5	w	3,5	w	3,35	vst	3,35	vst	3,34	vst	3,5	w	3,5	w	3,5	w
13b							3,34	vst										
14	3,34	vst	3,34	vst	3,34	vst	3,2	mw	3,2	mw	3,2	mw	3,34	vst	3,34	vst	3,34	vst
14b	3,34	vst											3,34	vst				
15	3,2	w	3,2	mw	3,2	mw	3,0	mw	3,0	mw	3,0	w	3,2	mw	3,2	mw	3,2	mw
16	3,03	w	2,97	mw	2,97	w	2,85	mw	2,85	mw	2,85	mw	2,98	w	2,98	w	2,98	w
17	2,83	mw	2,85	mw	2,85	w			2,70	w	2,70	w	2,84	w	2,85	mw	2,85	mw
18	2,70	w	2,72	mw	2,72	w	2,58	m	2,58	m	2,58	m	2,57	m	2,57	m	2,57	m
19			2,64	w			2,46	m	2,46	m	2,46	m	2,46	mw	2,46	mw	2,46	mw
20	2,57	m	2,55	m	2,56	m	2,39	w	2,38	w	2,38	w	2,38	w	2,38	w	2,38	w
21	2,45	w	2,45	m	2,45	m	2,28	mv	2,28	m	2,27	mw	2,28	mw	2,28	mw	2,28	mw
22	2,37	w	2,36	w	2,37	w	2,23	w	2,23	w	2,22	w	2,23	w			2,22	w
23	2,28	w	2,28	m	2,28	m	2,13	mw	2,12	mw	2,19	w	2,13	mw	2,13	mw	2,13	mw
24	2,22	mw	2,23	mw	2,28	mw	1,99	mw	2,00	mw	2,00	w	1,98	m	2,00	mw	1,98	mw
25	2,18	w	2,18	w	2,18	w			1,98	mw	1,98	mw	1,81	mst	1,81	mst	1,81	m
26	2,14	w	2,13	m	2,13	m	1,82	m	1,82	mst	1,82	m	1,67	mw	1,67	mw	1,67	mw
27	2,09	w	2,01	mw	2,08	w	1,70	w	1,70	mw	1,70	mw	1,54	m	1,54	m	1,54	m
28	1,99	m	1,98	mw	1,98	mw	1,66	mw	1,66	m	1,66	mw	1,50	mw	1,50	w	1,50	m
29	1,91	w	1,91	w	1,91	w	1,60	w	1,61	w	1,60	w	1,45	mw	1,45	mw	1,45	mw
30	1,87	w			1,85	w	1,54	m	1,54	mw	1,54	m	1,37	mst	1,37	mst	1,37	mst
31	1,82	w	1,82	st	1,82	mst	1,50	mw	1,50	mw	1,50	mw	1,20	mw	1,20	mw	1,20	mw
32	1,71	mw	1,70	mw	1,70	m	1,37	mst	1,38	mst	1,37	mst	1,18	mw	1,18	mw	1,18	mw
33	1,60	mw	1,60	w	1,60	w	1,20	mw	1,20	mw	1,20	mw						
34	1,54	mw	1,54	m	1,55	m	1,18	mw	1,18	mw	1,18	mw						
35	1,50	st	1,50	w	1,50	w												

b indicates oriented aggregate exposure of a sample treated with glycerine.

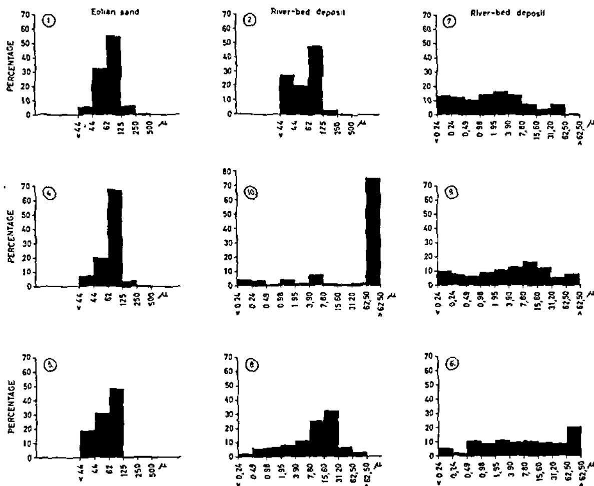


Fig 12 Granulometric histograms of some sediments in the Rang Mahal district Sample no. 10 is a typical playa-sediment.

On all the X-ray photographs there is a line at 3.70 Ångstrom, which is difficult to interpret. It cannot be seen very clearly in the untreated sample, but after decalcifying treatment with HCl and heating, it is more clearly seen; it does not, however, appear on the oriented aggregate exposure. This line probably represents felspar, but it is possible that it represents another mineral.

There has been no attempt to determine the quantitative composition of the different components of the samples.

These analyses show that a certain impoverishment of the clay minerals took place in the upper levels of the river bed. This is probably partly due to the fact that the flooding of the Sutlej and of the Ghaggar and its tributaries carried sediments to this area from many parts of the desert where the material obviously varied in origin and composition.

Some Soluble Salts from the River Sediments

In order to obtain some information about the soluble salts contained in the sediments, soil samples were taken at 5 cms. intervals in the soundings made across the bed of the Ghaggar.

The electrical conductivity of the soluble salts contained in every sediment sample was estimated thus: a mixture of 1 00 gram soil and 100 0 ml. water was left overnight and shaken for 5 minutes before measuring.

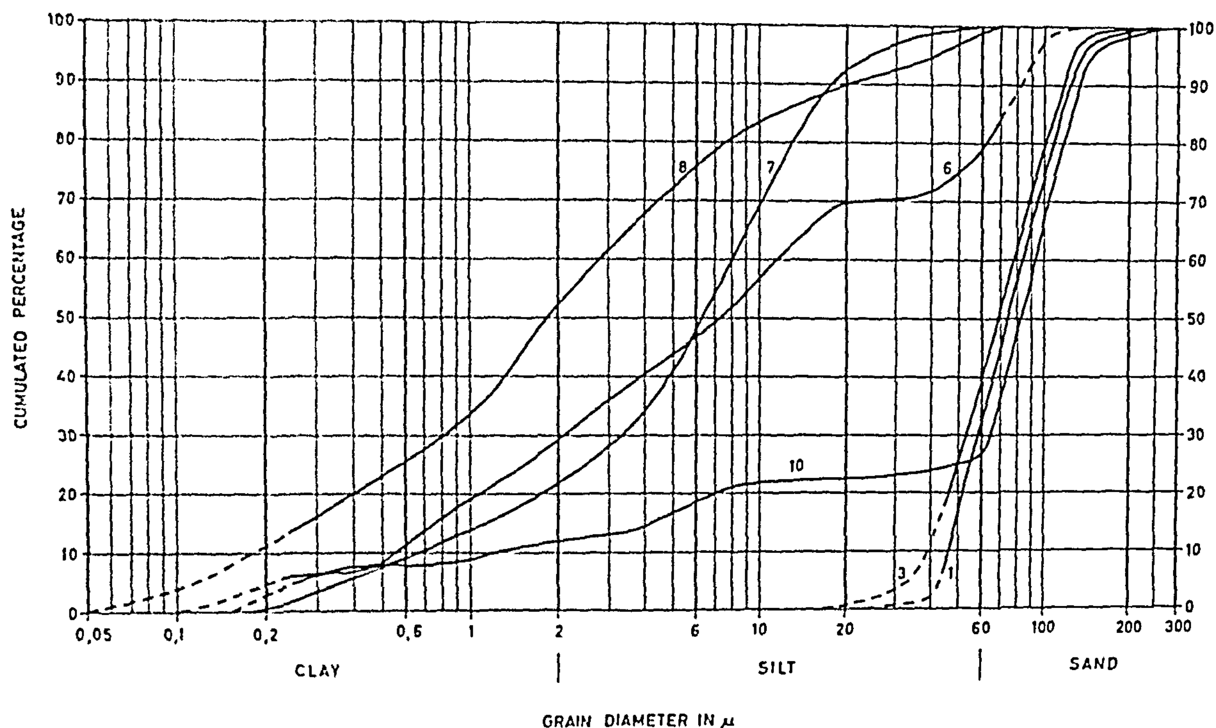


Fig. 13 a. Cumulative diagrams over the granulometric composition of some sediments in the Rang Mahal district.

The electrical conductivity was measured in all the samples from three pits: no. 13 near the northern bank, no. 10 in the centre of the river-bed and the pit below trench 1 at Rang Mahal, i.e. on the southern bank of the river. The resulting curves of salt concentration in the three sections correspond at many points (fig. 13 b). Common features of the curves are 1) an upper part with low concentration, 2) a middle part with a high salt content, corresponding in the main with the first half of the third fluvial stage, and 3) a lower part with diminishing concentrations. Within this division there are a number of marked minima and maxima.

The minima levels correspond roughly with the eolian deposits and are also very prominent at those levels which (irrespective of the nature of the sediment) were exposed to intensive and probably long-lasting droughts; e.g. that of the 2.3 ms. level which revealed deep cracks in the river-bed (see p. 30).

The most prominent maxima levels, common to the entire river-bed are: a) a minor peak at —380 cms., b) the large maximum between —300 and —200 cms. showing two distinct peaks at —235 and —200 cms., of which the former coincided with the first large flood recorded in the sedimental deposits of Lakha Dhora (fig. 10), c) the upper maximum between —140 and —100 cms. also showing two marked peaks; these coincide with the second large flood to deposit sediment on Lakha Dhora.

The salt concentrations, together with the geological sequence, demonstrate to us, therefore, those periods which were especially abundant in water, i.e. the flood periods. During the floods the deposits of clay sediment grew in volume and the increased water supply resulted in the deposition of larger amounts of salt when the river, which on these occasions was more like a large shallow lake, dried up. The thickness of the clay deposits, from such a large flood, would be between 10 and 20 cms. and the salts would therefore crystalize out in a homogeneous material. As a result of the homogeneous character of the sediment the leaching of the salts would proceed to a uniform horizon which appears graphically as our maxima, and which at the same time indicates the original shape of the river-bed. With the aid of these analyses it is therefore possible to correlate the different levels of the river-bed with the different horizons of the settlements in or surrounding the river-bed.

The soil samples were tested for the soluble salts of Na, Cl, SO^4, CO^2 and P^2O^5. The values of the analyses will be quoted in mg. per 100 gr. of air dry soil. Chloride was extracted with 1 m HNO^3, sodium with 0.1 n HCl.

Fig. 13 b. The frequency of some soluble salts from the river sediments.

The sulphate was identified by boiling with conc. HJ, the resultant H_2S closely corresponding in amount to the original sulphur content. Phosphate was identified with a solution of lactic acid (lactate values according to Egnér). Carbonates were tested with HCl. The pH of the water solutions of the salts was further ascertained.

Below a level of 50 cms. there is a surplus of Na in relation to the available SO^4 and Cl-ions and above this level there is a deficit. The Na-curve coincides exactly with that of the power of conduction.

Cl and SO^4 occur in extremely small quantities above a level of 130 cms.; below this level, however, there is a rapid increase in their concentration, which follows, roughly, the general salt curve. Carbonates occur throughout in a relatively high concentration.

The phosphates have a high maximum in the upper parts of the river-bed and two minor maxima at roughly the same level as the two large floods. Below the three metre level the proportion of phosphate is extremely low. These phosphates probably derive from the large settlement site of Bhamantheri, situated to the north of pit no. 10, and it is very likely that the curve indicates the periods during which it was inhabited.

The surplus of Na can hardly be due to the leaching of the upper layers, as in that case a relatively low pH value would be found in these layers, and this does not occur. (Eriksson, 1956)

It is outside the scope of this publication to discuss the results of these analyses in detail. We may, however, notice a few points. From a chemical point of view the sediments of the Ghaggar consists of a typical alkaline soil. It is rich in calcium and, owing to the high proportion of gypsum and the low water table (about 100 ms.), has not become extremely salty, but remained an excellent agricultural soil (pH 7.6—8.9), giving fine crops when provided with water. This type of soda soil is common in semi-arid areas and in India the group is known as "reh soils" (cf. Auden, 1942 and Sahni, 1951).

THE ARCHAEOLOGY OF THE RANG MAHAL REGION

It is described above on p. 23 how the river Sarasvati which is now called the Ghaggar, and the river Drishadvati once watered the area in the north of Bikaner and how this area slowly became a desert, the changing conditions finally driving away the people who lived there and for whom evacuation was the only answer to the sterility of soil. In our time, however, a country which supports a growing population cannot allow a still spreading desert to prevent otherwise fertile soil from bearing crops. In the light of the national importance of reclaiming soil for cultivation "The Council of the National Institute of Science of India" called a group of experts to a symposium in March 1952 "on all aspects of desert science, geology, climate, soil, water, mineral resources, solar energy, biology and methods of desert control".[1] On this occasion the present Director General of Archaeology in India, Shri A. Ghosh, gave the first public report on the notable results of the systematic topographical investigations of "some of the dried-up river-valleys in northern part of Bikaner"[2]; investigations which had been carried out over two seasons.

Seen in the light of the results reached by Sir Aurel Stein, during his survey of part of the Sarasvati valley in the winter 1940—41, this new investigation was, to quote Shri Ghosh, "a great thrill". Sir Aurel had declared that east of Fort Abbas in Bahawalpur State (now in Pakistan) there were no prehistoric mounds with pottery from the calcolithic, i.e. the Mohenjo-Daro/Harappa, period The map now drawn up by the Department of Archaeology in New Delhi, however, lists more than a hundred prehistoric sites in the Sarasvati and Drishadvati valleys. But, says Ghosh[3], "the richness does not consist only in the number of the discovered sites, but in their vast chronological and cultural range. For they comprise relics of several millennia of Indian history right from the Harappa period to comparatively recent historical times".

More than twenty-five mounds from the Mohenjo-Daro/Harappa period have been found in the area between the Pakistan border and a point half way between Hanumangarh and Suratgarh.[4] Most of the mounds of this period are fairly small but one, Kalibanga, situated between Hanumangarh and Suratgarh, is of a considerable size.

Another group of settlement sites within the same area is characterized by Grey Ware pottery. This group of pottery does not show any great variation in type; dishes and bowls are either undecorated or else painted with a limited variety of patterns. Red pottery with shallow, impressed designs is found together with the typical Grey Ware. A Grey Ware settlement site was found two kilometers to the north-east of Rang Mahal at the village of Bareke (fig. 6). Grey Ware

[1] *Rajputana Desert*
[2] *Rajputana Desert*, p 37 f
[3] *Rajputana Desert*, p 39
[4] It is beyond the scope of this publication to dwell on the latest excavations which have shown that this culture extended still further eastwards and southwards in the Indian peninsula *Indian Archaeology*, 1955—56, p 1, p 9 f

was also found in well defined areas at the foot of Lakha Dhora. These latter finds are obviously the remains of less permanent settlements.

It seems that the people who used the Grey Ware pottery as a rule avoided settling on the old Harappan sites. Traces of their settlements are insignificant, indicating that they lived in huts with clay walls, not even using unbaked bricks in their buildings.

It is very fortunate therefore that continuous sequences from the Harappan to the Grey Ware periods have been found in an area not too far from Bikaner. The most important site is Rupar in the district of Ambala, where extremely interesting excavations have recently taken place.[1]

It is possible, although not yet conclusively proved, that the Grey Ware people were the Aryans (known from the Vedic hymns), whose material culture has been hitherto unidentified.[2]

It is believed that the Grey Ware period at Rupar dates from about 1000 to 700 B.C. and at Hastinapura from about 1100 to 800 B.C.[3] On both sites this period is followed by one characterized by a black, polished pottery known as Northern Black Polished Ware (NBP) dated to ca. 600—200 B.C. NBP has been found on two sites in Rajputana, at Bairat in Jaipur and at Dhulkot near the town of Udaipur. At Dhulkot a "Black and Red Ware" pottery industry was found, indicative of the inverted firing technique. The recognition of this pottery is one of the latest archaeological discoveries in India.[4] It is presumed that this pottery was first manufactured in western and central India in about 700 B.C. and that it is to some extent contemporary with NBP.[5] In the Bikaner area no settlements corresponding to Bairat and Dhulkot have been found, but this does not necessarily mean that this stage did not exist there.

The third group of settlement sites identified during the recent survey are classed together as the Rang Mahal Culture — so named from the site now excavated by the Swedish Expedition.[6]

The map (fig. 8), kindly supplied by the Director General for Archaeology in India, shows the distribution of the settlement sites of the Rang Mahal culture along, or in, the bed of the Ghaggar. In the hundred kilometer stretch of the river-bed between the Pakistani border and past the bifurcation of the river, twenty-five sites of this period are recorded on the map.[7]

It is noteworthy that nearly all the sites are actually sited on the river-bed itself, indicating that when the sites were settled the river did not fill its entire bed but flowed, at a rate which varied according to the time of the year, between the settlements, which would rise above the water as islands. In some places the river bed is as much as ten kilometers wide, but the great importance of the water supply resulted in the settlements being placed as near to the water's edge as possible.

The water supply was already limited during the Grey Ware period; both the settlements at Bareke and Sardargarh, which have Grey Ware levels below the Rang Mahal levels, are situated far out into the river bed. Jetsar has a similar position, though a little less exposed.

The material from other sites of the Rang Mahal culture in the neighbourhood is, as far as one can judge from the surface finds, similar to that found at our excavations. Fig. 102 illustrates finds from other sites in the Rang Mahal region which, with the permission of the Department of Archaeology in India, have been incorporated with the collections of the Lund University Historical Museum.

[1] A summary of the results of these excavations is to be found in Sharma, *Historical Sites*, p. 123.

[2] Lal, *Hastinapura*, p. 151. Ghosh, *Notes*, p. 3.

[3] Lal, *Hastinapura*, Table 1.

[4] Sharma, *Historical Sites*, p. 150.

[5] Sharma, *Historical Sites*, p. 158, 159.

[6] See note, p. 43.

[7] It is very possible that the number will increase as the result of further, even more thorough, surveys.

THE MOUND OF RANG MAHAL

The Position of Rang Mahal. It has been seen how the dried-up bed of the river Ghaggar crosses the northern part of the former princely state of Bikaner from east to west. At a time when the Ghaggar could still supply water for this area, a large number of villages grew up along the banks of the old river; numerous mounds by the side of the river and in the old river bed testify to this settlement to this day A number of these mounds belong to the Rang Mahal Culture group (fig. 8).[1]

Two mounds of this group lie on the southern bank of the ancient river bed about five kilometres east of the town of Suratgarh. The larger mound, which was partially excavated by the Swedish Archaeological Expedition, is situated two-hundred metres to the west of the modern village of Rang Mahal and eight-hundred metres to the north-east of the large sandhill of Lakha Dhora (fig. 7).

A camel-trail passes through the southern part of the excavated settlement running from Suratgarh to the modern village of Rang Mahal and continuing thence in a north-westerly direction (fig. 15). Another camel-trail runs from Rang Mahal Railway Station, on the northern bank of the Ghaggar, passes by the villages of Bareke and Rang Mahal and continues to Suratgarh, passing in the process to the north of the excavated mound.

The Modern Environment of Rang Mahal. In this study the Rang Mahal region consists of a small area of which the dried up bed of the Ghaggar, roughly from Hanumangarh in the east to Anupgarh in the west, forms the focus. Rang Mahal lies midway between these two points.

The region can be characterized as a very flat alluvial plain covered by wind-blown sand in the form of dunes, which, like large, irregular waves, roll from south-west to north-east. The dry river-bed, which varies in width between three and seven kilometres, runs through this hilly landscape in an east-west direction. This dry, shallow, horizontal valley, which in certain years holds a little water for a few weeks as a result of the monsoon rains, resembles more than anything else a very wide road, running between banks of sand-hills of varying sizes. The distinction between the flood-plain and the sand-hills is clearly delimited by the high water mark of the last flooding.

The old settlement of Rang Mahal lies on the southern side of the Ghaggar, some hundred metres to the north of the large sand ridge known as Lakha Dhora. This ridge rises to a height of fifty metres above the present flood plain and is one of the highest points by the side of the

[1] The culture was named thus by Ghosh, *Rajputana Desert*, p 41.

river-bed in the area; it runs in a roughly north-westerly—south-easterly direction. To the south of Lakha Dhora lies an extensive sandy area with dunes of different sizes and shapes, while between Rang Mahal and Lakha Dhora there is today a sand-sheet with many small, irregular hills and a scanty scrub vegetation (pl. 3 and 4).

The great dry river-bed lies to the north of the settlement and is nearly seven kilometres wide at this point. It is a completely flat area, interrupted only by some small, low sand-hills, a number of ancient and modern settlements, and a sparse scrub and tree vegetation. A scattering of plants give a fresh colour to the desert during the few weeks of the rainy period; this is especially true of the old river-bed where the dominating brownish-yellow of the desert gives way, for a few weeks, to a lush green.

The most common domesticated animals in the region are the cow, zebu, camel, sheep, goat and dog. In the dry river area there are still a few decimated herds of gazelles, and in the old river bed there are millions of lizards. Snakes are also quite common.

The Ancient Environment of Rang Mahal. At the time of the colonization of the Rang Mahal region it was a relatively fertile area when compared with modern conditions. A number of circumstances conspired together to impoverish the region, and the inhabitants, consequently, had to abandon their villages and move to more fertile areas.

The main cause of this catastrophe was, as has been described above, the changing intensity of the monsoon. This resulted, among other things, in a decreased water supply in the Ghaggar, in shorter rainy periods and in an impoverished vegetation and a reduced animal population.

In the initial period of colonization at Rang Mahal, the settlement lay directly on the bank of the Ghaggar. Gradually the old course of the river (fig. 9) was filled with sediment and, when there was a great deal of water in the river, it overflowed its banks. Finally so much sediment was accumulated that the area, previously only covered by the floods, became the permanent river-bed. Consequently during the monsoon Rang Mahal became a small "island" in a very shallow temporary lake. This circumstance was of great importance to the settlement. Among other advantages a much greater area was made available for cultivation than had previously existed round the village. Every flood gave to the area new mud — fresh, rich in dissolved salts and very fertile. The inhabitants in Rang Mahal had no need to manure their fields, the river did it for them. When later the floods did not spread so far, water could only be supplied by the monsoon rains which, over a period of time, washed the surface salts of the sediments to deeper levels of the soil. This process has, after a time, a devastating effect on agricultural effort, for the accumulation of material ceases and the precipitation is inadequate.

While the Rang Mahal Culture flourished there was no complete sand-sheet between Rang Mahal and Lakha Dhora, such as exists today. When the river was in flood the area could be covered by water, save perhaps for some isolated, small sand-hills. Before the eolian sands covered the tract it was probably used as cultivated land, or as pasture.

The earlier settlers in the area lived in quite a hospitable district, covered with a somewhat more abundant tree and scrub vegetation than is evident today. Such conditions pertained as long as the water supply was good, the water table relatively high and the population, of both human beings and cattle, not to umerous. Pits dug across the dry river bed have demonstrated

the truth of this proposition (fig. 7); remains of roots and plants have been found in these pits, often at a great depth. These remains are found in areas where there is no vegetation today and are especially abundant in the area of the banks, where the eolian sand is the main component present. It is apparent that the bushes, trees and plants, which bound the sand dunes, dominated the vegetation.

As the period covered by the monsoon became successively shorter the areas available for cultivation decreased. Consequently there was no reserve of fodder for the cattle, and the inhabitants had to move to more fertile regions, so that the Rang Mahal area was gradually abandoned; the primary reason being the lack of pasturage for the cattle and the secondary reason, the lack of water for the human population. It is possible therefore that the sparse modern vegetation is more abundant than that available when the settlement was abandoned some hundreds of years ago.

Another result of the impoverished vegetation was that only a few bushes and trees now bound the dunes; the eolian sand began to move in over the old river banks and the cultivated areas, and especially along the northern bank. It was probably at this period that the large sand-sheet to the south of Rang Mahal was formed — a development which continues to this day (fig. 7 and 8).

The faunal population seems to have remained constant to the present day and only the intensity of the hunting practices has changed it.

The Topography of the Mound. At its base the mound is nearly circular, having a diameter of about two-hundred and fifty metres (fig. 15). The top is divided in three small hillocks, separated from each other by shallow depressions. The mound slopes rather steeply to the north and west, but more gently towards south-east. Two of the hillocks face the dry bed of the Ghaggar and between them is a comparatively deep depression, with a rain-water ditch in its lowest part. The highest point of the mound is in the north-west, where it reaches a height of 8.5 metres, its height to the south is 7.5 metres and to the north-east (the lowest point) 6 metres.[1]

A small ridge a hundred and thirty metres long and some twenty-five metres wide, runs in the direction N. 60° E to join the south-eastern part of the mound. The ridge is quite low save that the eastern end rises to a peak at +2 metres. The ridge has not been excavated.

The top of the mound has been used as a Moslem necropolis and part of it has been removed by quarrying for nitre and for burnt-bricks for building-material. Treasure-seekers have also worked on the mound.

As a result of the limited extent of the excavation the evidence available gives us but little information concerning the appearance of the settlement, when it was finally deserted. We may, however, infer that the last houses built on the mound were placed high up on its top. In an arid area like the Rajputana Desert, with a monsoon climate and adobe-houses, the inhabitants may well have been anxious to build their houses in a position high above the water running in the rivers during the monsoon, safe also from the threat of the flood.

The meagre amount of rain which falls, during the monsoon, in the Rang Mahal area, comes

[1] Throughout this publication the unit of measurement is the metre Measurements of height are taken from zero on the flat part of the bed of the Ghaggar

mainly from the south, west or south-west; only rarely does rain come from other directions. During the dry season of the winter monsoon the most common winds are those from the west-south-west, although north-westerly winds also occur and are not without importance. The wind conditions, therefore, seem to have remained constant — at least during the Historical period.

The direction of the wind during the monsoon season has resulted in the gradual removal of material from the abandoned houses (destroyed by the action of rain, wind, sun, and by the action of Man and animals) to the eastern area, thus filling the depressions on and around the mound. The fact that the western and northern slopes are the highest and steepest, seems due to the simple fact that the settlers built their houses on these faces.

The lower part of the southern slope of the mound is covered with a bed of eolian sand (fig. 15) which is peripheral to the sandy region which extends south of the old river-bank (fig. 7). The bed is about 20 cms. thick. During the heavy monsoon rain material is inevitably washed down from the surface of the mound and, along the edge of the mound, the eolian sand becomes mixed, or covered, with this material, during the alternation of rainy and dry seasons. Strata of this type can accumulate to a considerable depth. To judge from the conditions at Rang Mahal a mound formed in this manner, situated in a semi-arid area like the Rajputana Desert will, with the passage of time, become lower and wider.

Most of the buildings were adobe-houses. If houses are built on the highest part of the mound these parts will accumulate material most quickly in the process of demolition and rebuilding of the settlement when the climate changes. Only a small portion of the material from a house which has been destroyed will be carried away from its original position to the lower parts of the mound. The rain during the monsoon season is very heavy and is always accompanied by strong winds — even in the area of Rang Mahal the monsoon can sometimes reach storm force. The rain beating against the walls of an adobe-house will dissolve and wash away the outer surface of the bricks; if there are fissures or cracks in the wall the rain will soak into them and accelerate the decay of the house until finally it collapses.

GEOLOGICAL ASPECTS ON THE SETTLEMENT AT RANG MAHAL

At the time of the initial settlement along the banks of the Ghaggar there were, as there are *today, many sand-hills of all sizes and shapes on the banks of the river, and in the middle* of its bed (fig. 9). It is very likely, therefore, that many of the settlements along the banks of the river and in its bed were built on large dunes. During the rainy seasons and periods of flood these sand-hills stood out like small inlands, on which the inhabitants could live in relative security

In order to understand fully the ancient settlement at Rang Mahal it was necessary to obtain some information concerning the water-supply of the area, of the height of water in the Ghaggar, and of the relation of these two phenomena to the settlement. We have touched upon the first problem in the previous chapter. In order to solve the second problem pits were dug and deep drillings were made through the bottom of the two trenches excavated in the mound The evidence provided by the strata in these pits, together with that obtained from the series of pits excavated across the bed of the Ghaggar, enables us to reach certain conclusions, which are discussed below.

The map (fig. 15) shows the position of the trenches; the pits, excavated to obtain the sequence of the strata in the bed of the Ghaggar, are shown in fig. 7 and 10 The trenches are situated about 50 metres from the present bank of the Ghaggar. The correlation between the sequences obtained in the trenches of Rang Mahal and those obtained in the Ghaggar is quite clear The soundings in the trenches were about one metre square and were carried down to a depth of two metres below the bottom of the trenches, to a point where the top of a sand dune, evidently some metres thick, was found. Beyond this point the soundings were continued with a post-hole auger to a depth where the sand was so unstable that the walls of the soundings collapsed and the drill could go no deeper.

The First Period of Settlement

The top of the sand dune, described above, was reached at a depth of — 430 cms. (fig. 7). The stratum may have been between eight and ten metres deep and, indeed, the dune may have been higher on the south side, i.e. away from the river.

In the previous chapter we have seen that it is probable that the dry period, during which this dune was built up, changed, relatively abruptly, to a period with higher precipitation, or at least to a period during which the volume of the Ghaggar was much larger than earlier. During this period the accumulation of sediments in the river-bed increased and the water-level rose until

the dunes gradually became flooded and silt, clay and fine sand were laid down on its slopes and, ultimately, on its cap. The distinct limits between the strata, and the difference of their texture and structure, indicate alternating dry and wet periods and a fluctuating water-level.

Stratum 25. While the dune was still a part of the river-bank the first known colonists settled. Remains of their colonization are found at a depth of about —350 cms. in the lowest part of an eolian sand bed (fig. 10). The finds from this period consist of a number of small fragments of pottery lying in more or less the same horizon. The size of the potsherds forbids of chronological analysis. The fabric is that of the common Rang Mahal red ware.

This eolian sand is grey-brown in colour. It lies in a stratum which is about a metre thick and it has, in its uppermost part, been redeposited by the action of the river-water. Two or three centimetres down in the bed were found traces of small holes made by snakes and lizards at a time when the beds still lay above the water-level. The same type of holes are found today in the large dunes along the dried-up river-bed and in the small dunes on and in the bed of the Ghaggar where numerous snakes and lizards live. The holes are often filled with material from the river-bed or with the excrement of the animals that lived there.

If one travels along the dry bed of the Ghaggar today one can see on the banks a large number of areas of varying size which consist of potsherds and fragments of burnt brick. Such remains come from ancient settlements or from villages in the neighbourhood. In the course of time they are covered by wind-blown sand or by clay from the flooded river and disappear. There are many such areas, showing traces of ancient settlement in the neighbourhood of Rang Mahal, and they are especially common on the slopes of Lakha Dhora — owing to lack of time none of these patches were examined by the expedition. It is possible to interpret similar areas in the deeper levels of the mound at Rang Mahal.

The small number of potsherds in stratum 25 are probably from one of these areas, the fragments have been deposited on the slope of the dune and later covered by eolian sand which very easily accumulated near the water line, especially if the river-bank is a sand-dune.

The potsherds found in this stratum could possibly have arrived there by chance, but it is more probable that there was a settlement, of some sort, somewhere in the neighbourhood. If this is indeed the case the settlement must have been situated on the south side of the dune — probably at a higher level.

The corresponding horizon in trench RM I is a bed of silty clay, mixed with sand (fig. 10). The horizon has yielded no pottery or other signs of habitation — this is in part due to the fact that this area was, at the time under consideration, a small inlet and that archaeological finds are discovered rather more to the south of the trench. The horizon is dark brown in colour — a few areas of iron-precipitation are also to be seen; these are due to a fluctuating water-level.

The Ghaggar. These first colonists settled at Rang Mahal during a comparatively dry period. The climate was probably similar to that which pertains today — even though the wind conditions were somewhat different. This can be seen from the fact that a great number of eolian sand beds occur in the bed of the Ghaggar at the same level as stratum 25 (fig. 10). The dry season seems to have lasted for some time — or at least the wind must have been very strong — for sand beds are found in nearly all the pits dug across the Ghaggar and below Rang Mahal; in stratum 25, the sand is at least a metre in depth. Later, when the water supply had increased, sediments of

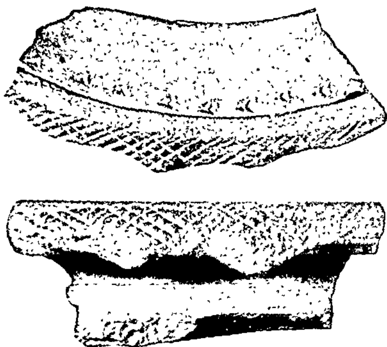


Fig 14. 1/1 Fragment of cooking vessel of very thick ware, found in stratum 25

clay and silt were deposited on the sand beds. There has been no equivalent deposition of eolian sand in such quantities in the bed of the Ghaggar since that period.

In pit no. 10, in the middle of the Ghaggar, at the same level as the horizon of eolian sand, a group of potsherds were found. The lowest point at which potsherds were found was about — 400 cms. (cf. p. 48); a fragment found here was from a rim of a cooking vessel made of a red fabric.[1]

50 cms above this point was found another smaller potsherd which was probably of the same red fabric. The fragment was too small to be classified. Both these fragments were found in a deposit of clay mixed with fine sand. This deposit was superseded by a clay layer (nearly 10 cms. thick) which must have been laid down, as sediment, when the river was in flood. The stratigraphy demonstrates that the fragment fig 14 corresponds to the fragments found in stratum 25, below Rang Mahal. These two finds were probably deposited before the first settlement at Rang Mahal took place.

For a number of reasons the excavation had to be limited, but from the facts we have enumerated above and from observation of the spoil heaps of potsherds, burnt brick and other debris round a modern settlement, it is possible to conclude that there was no earlier settlement at Rang Mahal, than that which existed when the level of water in the Ghaggar was between three and a half and four metres lower than the surface of the present dry river bed. It is clear also that certain people were using red ware in the neighbourhood before the initial settlement at Rang Mahal The finds deep down in pit no. 10 may have originated in the settlement at Bhamantheri a few hundred metres to the west.

[1] The fragment is shown in fig 14 In shape it is of the same type as the decorated cooking vessels, found in the middle and upper layers of trench I and II (e g pl 57 2—7 Pl 55 2 has also a wolf teeth's decoration on the rim) But fig 14 differs from the other material because of the ware, which is extremely thick From that point of view it is unic H R.

Traces have been found in the district of the Grey Ware culture — which is older than the Rang Mahal culture. In the immediate neighbourhood of Rang Mahal, the village of Bareke and the northern slopes of Lakha Dhora are sites where Grey Ware pottery is found. As no excavation has taken place in the area to elucidate the transitional stage between these two cultural epochs, the problem remains unsolved.

Stratum 24. This stratum has produced no pottery or other traces of settlement. It is a bed of eolian sand containing many holes made by lizards. In a number of these holes and in the bed of sand itself were found a number of pieces of hard clay which are of special interest. The size of these fragments varies between a few cubic millimetres and a few cubic centimetres; they are more or less angular and of very irregular form, many resembling small blocks. Some of them could be the product of sedimentation in the lizard holes, but most of them do not come naturally to the layer and can only have appeared here as the result of some human agency. We shall see that similar phenomena occur in the higher levels of the mound, and here they apparently result from digging by Man. It might therefore be possible to explain these lumps of clay as the result of digging in the sand in search of sun-dried brick. Nothing else found in this stratum indicates the presence of a settlement here — neither potsherds, nor discolouration of the sand — so this evidence is not conclusive.

Stratum 23 consists of a brownish-yellow clay, 50 cms. thick below RM II, and a little thicker below RM I. The texture and structure of the sedimentary deposit of this layer is quite uniform and it is evident that its deposition has not been interrupted by any long, dry seasons. The thickness of the deposit indicates that it was laid down during a period, or periods, of high water. It is probable that the Ghaggar flooded and that the flooded condition remained more or less permanent for some time. During the flood the inhabitants of Rang Mahal must have moved out of reach of the water to higher places. Conclusive evidence supporting the theory of flooding is provided by a bed of clay, about 10 cms. thick, deposited on the side of Lakha Dhora (fig. 10). The clay was laid down on eolian sand. This was the first time that water from the Ghaggar reached a sufficient height to deposit material on the slopes of Lakha Dhora — it must have been something in the nature of a catastrophe in the area.

The Second Period of Settlement

Stratum 22. Traces of a presumed settlement at Rang Mahal are next found at a depth of about —200 cms. The finds from this level consist of sherds of the common red ware pottery; they are described and discussed on p. 49. They were found in eolian sand mixed with clay in a typical river-bank stratification.

The pottery is scattered in a manner similar to the fragments in stratum 25. There are many shells of *Pila globosa* in this bank as well as concentrated deposits of Na and Ca salts.

If, as seems probable, the potsherds came from a proper settlement in this area it is evident that the settlement must have been initiated before stratum 22 was laid down; for when, at a later date, the Ghaggar flooded the settlement, the potsherds were covered and mixed with the sediments brought to the site by the flood.

The Ghaggar. The initiation of the second settlement at Rang Mahal is correlated with a

distinct horizon in the series of strata of the bed of the Ghaggar (cf. p. 30 f.). This horizon is that of an extremely dry period which resulted in many deep cracks in the river-bed (fig. 10). Sometimes these cracks are more than half a metre in depth and are usually filled with eolian sand which further indicates the dry climate. On this "dry surface", in most of the pits dug across the Ghaggar, a largish number of potsherds were found. The potsherds are all of the red ware common at Rang Mahal. So many traces of pottery in one horizon probably indicate that the inhabitants moved around the area in search of water, or of land on which to grow corn and rear cattle, after a period of low rainfall. Whatever the interpretation it is indeed surprising to find potsherds in so many pits, so far from the old mounds and concentrated at the same level. It is good evidence, however, of a dense population in the area and for the presumed second settlement at Rang Mahal.

Strata 21—19. This dry period gradually gave way to a period during which there was plenty of water — a period when the Ghaggar ran high and when there was an increased accumulation of sediment in the river bed. All the three strata, 21—19, consist of clay mixed with fine sand. The percentage of fine sand is largest in the two lower strata. No potsherds or other traces of settlement were found in these strata. Owing to a different rate of sedimentation there is a slight change of colour in each level.

Strata 18—17. The water supply continued to increase and the bed of the Ghaggar was raised higher and higher until finally the level of water in the river rose to such an extraordinary height that the area was flooded and clay deposited on the slopes of Lakha Dhora. This is the second and last time that the level of the water caused the deposition of sediments on the sides of Lakha Dhora. The sediments are about 30 cms. thick here, while at Rang Mahal they are about 40 cms thick. A thin horizon of eolian sand between the two strata, 18 and 17, indicates that the high level of water was not permanent but was broken by dry periods. The sediments accumulated over a long period of time and sand-storms were frequent. There are no dry cracks or other signs indicating long intervals between the rainy and dry seasons. The strata are comparatively rich in shells of such molluscs as *Viviparus bengaliensis*, *Pila globosa*, *Planorbis exustus* and a number of species of *Bithynia*.

The water level must have been quite high during this period, for a short time at least, and the inhabitants can hardly have lived there under such conditions. It is probable, therefore, that Rang Mahal was abandoned for some time during this period. If this were not the case there would have been at least a few traces of settlement in this thick stratum. As the soundings were taken only on the north side of the mound, the conditions in the south are not accurately known. It would be possible, in the light of this factor, to say that because potsherds were only found in strata of extremely dry periods they must have found their way there at a time when the settlement had moved nearer the river during these dry seasons. It is true that the settlement on the south face could have been more permanent under normal conditions of water supply. This theory is both possible and probable, but it is evident that during the very wet periods Rang Mahal was flooded and that the inhabitants must have evacuated the mound. It is also possible to talk of different periods of settlement, even though it might be impossible to determine their dates.

The Ghaggar. The strata corresponding to 18—17 in the bed of the river show similar features

and give evidence towards similar conclusions (fig. 10). The river-bed strata, in all the soundings, consist of fine clay mixed with sand, rich in shells and with no traces of settlement. The high level of the water was most clearly seen in the sounding (pit no. 1) made in the slope of Lahka Dhora.

The Third Period of Settlement

We have seen that there are three small peaks on the top of the mound (fig. 15). The two trenches RM I and RM II intersect the north-east and north-west parts of the mound respectively. The eastern section of the trench II touches the ditch which separates the north-eastern and north-western peaks, so that the reason for the formation of these peaks, if apparent at all, should appear in our analysis of RM II.

Both these trenches showed that this, the last period of colonization, started on roughly the same level — known as stratum 17 in RM II. The horizon consists of clay which was deposited during one of the periods of high water (fig. 16).

A shallow pit was dug by the settlers in the eastern part of RM II, the pit extends in a southerly direction from the shore of the Ghaggar towards the other side of the trench. Owing to the limited area covered by the trench only one edge of the pit can be seen here. This edge, however, consists of a rough, nearly vertical, face, which can be seen 2.5 m. west of the north-east corner of the trench. The pit is here 30 cms. deep and is obviously man-made. Part of the clay spoil from this pit was thrown up on the western side and consequently the stratum lost its smooth horizontal surface. The appearance of the pit suggests that it might have been dug to obtain building material or brick-clay. We shall see later how traces of a large wall were recovered from this stratum. Near Rang Mahal, outside Suratgarh, many similar pits can be seen to this day, which provide the clay for brick production; the clay being fired in kilns of various sizes. Whether this is the case, or not, the pit seen in RM II was not used as a small harbour as might be thought from its position. Further evidence that the pit was a quarry for clay is provided by the presence of potsherds and fires on the flat bottom. From these facts it seems that this cavity bisects the northern part of the settlement.

This chapter is intended to give a summary description of the different horizons in the eastern part of the trench II and to relate them to the strata in the dry bed of the Ghaggar, to the walls of the buildings of the old village and to the climatic conditions of the various periods. The walls and the architecture of the houses as well as the archaeological evidence are discussed pp. 64 f., 81 f.

The trench RM II was laid down sixty metres to the south of the bank of the Ghaggar and on the south-eastern slope of the north-western part of the mound. It was 30 m. long and 5 m. wide, and there was a difference of three metres, at ground surface, between its eastern and western end. The eastern end of the trench was excavated down to the natural soil and will be described in greater detail here — the western part of the trench was incompletely excavated and will be touched upon at the end of the chapter.

Stratum 16 overlies 17, i.e. about a metre below the present bed of the river. Southerly winds, stronger than those pertaining today, followed on the great flood which laid down stratum 17. This fact is made clear by the accumulation of eolian sand in the northern part of the mound. Here the mound was covered with a sand-bed which was probably of the same type as that

which appears to the south today (fig. 15). Two small areas of eolian sand are marked on the map, they are about 20 cms. thick in the centre and taper gradually towards the edges. The sand accumulated on the leeward side of the mound is a result of northerly wind action. The dryness of this season is emphasized by the vertical cracks through stratum 17 and by a thin deposit of calcium salts between strata 17 and 16. There are no signs, in the bed of the Ghaggar, of any extraordinary accumulation of sand, or other products of a dry period, at this time.

The bed of sand is about 10 cms. thick in RM I and, as a result of an admixture of charcoal and other organic material, the colour is dark brown. In RM II the large pit, described above, was completely filled with eolian sand and with the angular pieces of clay we have noticed previously, which may have resulted from the disturbance of the clay (during digging operations, for instance). In the upper level of this infill are fragments of pottery and burnt brick. The pit was dug near to the river, or perhaps between the river and the settlement. The eolian sand which eventually filled it reflects this fact, for the sand is quite clean near the river, being mixed with only a few fragments of pottery, while in the southern and western areas of the trench and for a few metres towards the centre of the settlement, the sand has been very much mixed with clay, pottery, and other dark constituents.

At the south-eastern corner of the trench is an accumulation of burnt bricks, charcoal and other materials of a darker colour. These fragments are evidently all that remain of an important building which possibly stood just to the south of the trench. Most of the burnt bricks are broken. The dark area round this burnt area runs westwards on the upper face of the stratum, tapering gradually away.

Most of stratum 16, which is mixed with clay and various remains of the settlement, is green in colour. This coloration can also be seen in the upper levels of stratum 17 to a depth of about 10 cms. The colour occurs throughout most of the area revealed by the trench

Wall H 7 W¹. The wall, H 7 W¹, was built during the period of deposition of stratum 16 — only part of this wall survives (fig. 35). Material with a greenish tint occurs below the wall in stratum 17.

The pit, P, was found about a metre to the east of the wall H 7 W, on the north side of the trench. The pit was sunk well into stratum 17, i e into the natural soil.

The Ghaggar. The monsoons were heavy and of long duration, when compared with modern conditions, during the subsequent period. The rainfall, at least, was heavier, to judge from the thickness of the layers in RM II. In the Ghaggar the contemporary strata consist of clay and the sedimentation has been quite even, with the exception of soundings 9 and 10 in the middle of the Ghaggar, where a sharply defined black stripe breaking the horizon demonstrates that this part of the Ghaggar was for some time a riparian zone. In the other soundings similar marks do not occur in equivalent positions. In the middle of the Ghaggar the clay bears the marks of iron staining which also indicates the riparian nature of the deposit in this area.

For reasons mentioned above strata 15—13 are all comparatively thick and uniform — they are in the main of the same texture and structure and have the same dark-coloured elements.

Stratum 15 consists chiefly of a yellow clay mixed with a fine eolian sand To the south in this stratum is an area which contains much charcoal and other dark-coloured elements Bones of *Bubalus bubalus* and *Bos taurus indicus* are common throughout the stratum A few metres to the

west of the south-eastern corner of the trench is a bed which contains potsherds and thin layers of calcium salts. Above this, a curved, thick layer, consisting chiefly of charcoal and ash, indicated the presence of a fire-place. It is evident that the northern part of the trench intersects the peripheral areas of the settlement, where indications of settlement are rare. Artefacts are more abundant in the southern part of the trench. The upper ten centimetres of this stratum consists of clean, yellow natural clay with no foreign elements; in the east, however, the size of grain is somewhat larger and the clay has been mixed with eolian sand.

This complicated stratum was, in all probability, deposited in a single rainy season. The earliest material in the stratum, which has an admixture of artefacts, has its origin in the buildings which were destroyed by the rains of the monsoons, and is thickest in the southern part of the trench, tapering off to the north. Later the waters of the Ghaggar rose and, flooding this area of the settlement, overlaid the bed of debris with a sedimental deposit. The sediment is thickest in the northern part of the area, i.e. towards the river. A number of thin horizontal layers of calcium salts also occur in this stratum. The buildings, the debris of which formed the lowest layer of the stratum, had stood to the south of the face of the trench, i.e. somewhat to the west of wall H 7 W. This wall, itself, was very probably destroyed during this period. The northern side of the trench reveals in section that the uppermost part of stratum 15 contains scattered material with greenish colour, fragments of burnt red bricks and angular pieces of hard, natural clay.

Stratum 14. Between the strata 15 and 14 are a number of thin beds of eolian sand, indicating a dry season. Otherwise the limits between the strata are obscure; the sand, with certain beds of ash, indicates the limits of the horizons. Strata 14 and 15 are very similar in texture, but there seem to be more burnt red bricks and animal bones in the upper stratum.

Both strata revealed comparatively few dark-coloured elements; we may assume from this, and from their riparian position, that the buildings whose debris forms part of these strata were not dwelling houses but some sort of earthern barriers, which were intended to protect the settlement from the waters of the Ghaggar, or store-houses, or similar structures. The buildings must have "melted away" during the monsoon, the material remaining where the buildings once stood, perhaps a little debris being washed away on the eastern side. The material was washed down from the higher areas to the west of the trench and deposited a couple of metres to the west of the eastern face of the trench (fig. 16).

Wall W 3[1]. This wall was built on top of stratum 14 during the dry season which followed the formation of stratum 14.

The greater part of the wall was destroyed during a subsequent period of heavy rains; probably at the time when stratum 13, or perhaps 13 A, was laid down. The fact that courses of the wall remain is due to the covering of certain portions of it by material washed down from higher places outside the wall. Another reason for the preservation of this section of the wall may be that the inhabitants threw earth against the wall while digging.

The wall, or at least part of it, was later rebuilt, as we shall see, on top of stratum 13.

Stratum 13 A was laid down as a result of a high-water level in the Ghaggar. To judge from the position and extent of the stratum the heightening of the water level of the Ghaggar depends primarily on an increased supply of water from the Himalayas; the water provided in the area by the monsoon rains is of secondary importance. During this flood the low area between the

two northern peaks — the earlier pit — became a small bay in which was deposited the material carried in suspension by the river.

The sedimentary material consists of a common yellow-brown clay which later acquired a greenish tint, especially in the upper levels. Otherwise the stratum has no other dark coloration; neither were any potsherds or burnt bricks found. At the bottom of the stratum was found a large deposit of animal bones.

The suggestion that the above mentioned houses were built to the west of W 3[1] is also supported by the fact that, to the east of the wall, the surface of stratum 13 A is covered by a layer of potsherds, deposited during the dry season that preceded the laying down of stratum 13. These potsherds are mixed with the clean eolian sand of the lee side of the mound. The presence of the potsherds here may be accounted for by the fact that in this place there was a shallow cavity east of the wall, into which had been thrown broken household utensils. The cavity was situated in a peripheral part of the settlement as the eolian sand covering the potsherds contains no darker admixture and the area was not disturbed by the inhabitants.

Stratum 13 was formed during a period of comparatively high rainfall; the water in the Ghaggar was so high that it caused extensive flooding of this part of the settlement. The stratum consists of a clean, yellow-brown clay which, above the small cavity to the east of the old W 3[1] where there was a bed of potsherds, was somewhat stained green. Otherwise pottery and other signs of habitation are rare. Some five metres from the eastern side of the trench (in a similar position to the remains of W 3[2]) is a low ridge running in a north-south direction. This is made up of natural clay which contains a few fragments of pottery and burnt brick. The ridge is all that remains of a wall of sun-dried brick (probably W 3[1]) which collapsed during the monsoon, part of the material remaining *in situ* while the greater part was carried in suspension downhill to the east and north. Stratum 13 is comparatively thick — nearly 50 cms. — and we can thus infer that most of the houses in the Ghaggar area were destroyed during this heavy monsoon.

Wall W 3[2]. During the dry season, or seasons, which followed, many large new houses were built on the surface of stratum 13, some of them in the excavated area. While the settlement seems to have moved gradually northwards on the mound, i.e. nearer to the Ghaggar, houses were still being built to the west of the ridge-like remains of wall W 3[1]. No houses were yet built over the pit, described above in reference to stratum 16.

Pl. 9:2 illustrates the house and walls built and partly rebuilt during this period. Here we can only mention the easternmost walls of the range. From the eastern end of the wall H 7 a W a new wall, W 3[2], was built in a southerly direction, continuing outside the area excavated.

Wall H 7 a W[1]. The first stage of building of H 7 a W is H 7 a W[1]. It was built on the surface of stratum 13, which here slopes gently eastwards.

Wall H 7 W[3] was built on stratum 13 at the same time as the above mentioned walls.

In the periods which follow the strata become more complicated than in the lower levels, and this is especially true in the areas nearest the Ghaggar. When walls were partially destroyed the area naturally took on a bumpy configuration and the strata became irregular, of small area and greater inclination. In the northern face of the trench some of these strata, 11 A, B, C and C 1, could easily be seen, lying on the slopes down to the Ghaggar.[1]

[1] The numeration of strata may seem strange, but to avoid confusion these numbers, given to them in the field and used in the numeration of the finds, are retained.

Stratum 11 C[1]. At the bottom of this stratum is a thin bed of charcoal and dark matter. The stratum itself consists of brown-yellow clay mixed with fine sand, stained green in its eastern area. Precipitations of calciumsalts are of frequent occurrence, sometimes occurring as spots, sometimes, especially in the eastern part of the stratum, as stripes. Charcoal and pottery occur throughout the stratum and in the west, near pit P, the stratum consists almost entirely of potsherds and fragments of red, fired brick. A number of fragmentary animal bones were also found. On top of the stratum is a bed of charcoal, some 3 cms. thick, which appears throughout the trench at the same level.

Wall H 7 b W. A wall, H 7 b W was built on the upper surface of 11 C[1] (fig. 16).

Stratum 11 C. The composition of this stratum is the same as that of the preceding stratum; there is an accumulation of potsherds, however, at its eastern end. These layers of calcium salts are of frequent occurrence, as are also charcoal elements.

Stratum 12. The comparative chronology of these strata is obscure as they were deposited in a somewhat irregular fashion; stratum 12 seems to have been laid down in the eastern part of the trench while 11 C[1] and 11 C were being deposited in the north. When the water in the river was high the low area above the pit (described in our discussion of stratum 16) probably became an arm of the river, in which clay mixed with fine sand was deposited. The clay later acquired a greenish tint. During one of the subsequent dry seasons pottery and pieces of red, fired bricks were thrown into the pit and a thin layer of eolian sand was deposited. The conditions under which this took place were very similar to those which pertained when the two strata 13 A and 13 accumulated. During a later monsoon a new bed of clay, mixed with fine sand and a great deal of charcoal, was laid down on top of the bed of potsherds. This clay also acquired a greenish tint with the passage of time.

Stratum 11 B. To the west and north of the trench, houses were still being built and the mound was still growing in height. 11 B, which is situated in the northern part of the trench, consists of clay mixed with fine sand. Material with a greenish tint and charcoal were detected between the walls H 7 W and H 7 bW. At the bottom and at the top of the stratum are thin beds of calcium salts.

Wall H 7 W[2]. Stratum 11 B corresponds to bed H 7[1] below the wall H 7 W. The bed consists of clay with intrusive material with greenish tint and charcoal elements as well as fragments of pottery and sun-dried bricks. That part of H 7 W, known as H 7 W[2], was built on this bed (fig. 16).

Stratum 11 A. The western part of this stratum consists of comparatively clean, yellow clay which has been mixed up in the eastern part by a fine sand of brown-yellow colour. A number of sherds of pottery were found as well as a number of pieces of hard, dry, natural clay.

Stratum 12 A lies on the north-eastern slope of the mound, to the west of the old pit. It is not a very large stratum and consists of clay mixed with fine sand. It is deep green in colour and contains a number of thin streaks of gypsum and other calcium salts, each following the configuration of the stratum. Potsherds are rare, but there are some remains of charcoal.

Stratum 11. Cultural remains in this level depend on the propinquity of the dwellings. In the lower part of the slope, above the old pit (fig. 16), the material is almost pure clay of a greenish colour. On the north-eastern slope of the mound, higher up and near the adobe-houses, are many

traces of habitation. Stratum RMII:11 (fig. 29) and the lower part of stratum RMI:14B (about 1 dm thick, fig. 19) consist of fluvial material. They are situated on the same level and are deposited during the same floodperiod. The upper part of stratum RMI:14B is consequently younger than stratum RMII:11.

Wall W1. The first traces of a house above the old pit, which we presume to have bisected the northern part of the mound, are the remains of a wall which rests on the top of stratum 11 (this can be seen in the eastern face of the trench, fig. 16). This wall (W1) was constructed of sun-dried earth taken from the bank of the Ghaggar — this is demonstrated by the fact that the earth contains pieces of clay mixed with fine sand, shells, potsherds, charcoal and small gypsum-covered grains of soil. The cement which fastens the bricks together comes from the charcoal-bearing culture layers in the immediate neighbourhood. What remains of the wall is 95 cms. wide and 40 cms. high. The wall extends, for an unknown distance, in an easterly direction from the eastern face of the trench. It extends only a few decimetres to the west of this line, being destroyed beyond this point so that it is impossible to calculate its original length. The wall cannot be related to any other excavated wall in this trench and probably belongs to a house to the east of the excavated area.

Stratum 10. Near the Ghaggar the strata 10 and 11 are separated by a thin layer of calcium salts; in the southern part of the trench a bed of eolian sand forms the boundary between the strata — both phenomena indicative of a dry season.

To the south of W 1 the stratum consists of clear, yellow clay containing a few fragments of pottery which have obtruded, with a little charcoal and a few fragmentary red, fired bricks. More cultural traces are found to the north of the wall, where there are also many fragments of animal bones and traces of calcium salts.

To the west of a small pit, P 8, in the northern face of the trench (fig. 16) a number of thin beds of clay with sand and calcium salts form stratum 10. The upper horizon of this stratum consists of a layer of gypsum and other calcium salts; this horizon, which is nearly 2 cms thick, can be traced almost throughout the trench. A comparatively thick bed of calcium salts in RM I is certainly of the same age.

The Ghaggar. While strata 14—10 were being deposited on the mound to a total depth of about one metre, sediments accumulated in the bed of the Ghaggar to a depth of between 20 and 30 cms. (fig. 10). During this period the mound of Rang Mahal had grown so high that the risk of flooding by the Ghaggar was virtually non-existent. The sediments in the bed of the Ghaggar consist of clay mixed, in a few places, with beds of eolian sand. The sedimental structure is very uniform, there are no indications of the presence of running water and it seems that the decrease in the deposit of material can be correlated with a decrease in the volume of the water of the Ghaggar. Signs of longish dry seasons, e.g. beds of eolian sand and cracks, are of infrequent occurrence and the monsoon probably gradually usurped the roll of principal source of water for the area.

Walls $W3^1$, H 7 a W^2, and *W^2*. Stratum 10 seems to have been deposited during a particularly heavy monsoon period. Large stretches of the standing walls were destroyed and added to the debris which formed part of the layer. The ragged walls were repaired and partially extended during the subsequent dry period. In RM II portions of three walls were completed during this period.

Wall W 3 was repaired for the third time (fig. 30).

New parts were added on top of the western end of H 7 a W — these new additions being labelled H 7 a W² (fig. 33).

A wall, W 2, was built and could be seen in the northern face of the trench (fig. 16).

Stratum 9. The stratum consists of a brown-yellow clay mixed with some fine sand, potsherds, charcoal and other dark-coloured elements. As in the preceding stratum the potsherds etc. are more frequent to the north of the wall, W 1, than they are to the south of it.

Stratum 8 A. In the southern face of the trench this stratum tapers off towards the east. It consists of eolian sand, redeposited by running water, which originated from a higher area south-west of the trench. The stratum contains a proportion of gypsum-covered grains of soil, dark-coloured elements and fragments of animal bone.

Stratum 8. A pit, 8 P, was dug during the dry period which preceded the monsoon responsible for depositing stratum 8. The pit was 180 cms. to the east of wall W 2; it was 25 cms. deep and in the north-eastern trench-face it was 20 cms. wide. Fragments of burnt bricks and pottery were found in its bottom.

Stratum 8 consists of yellow clay mixed with much fine sand; the sand sometimes contains scattered fragments of hard clay. Animal bones, plant remains, potsherds, charcoal, a few shells and grains of sand covered with gypsum are of frequent occurrence in the stratum. Occasionally thin beds, laid down by running water, were found in the stratum.

Stratum 7. This stratum, thickest in the northern part of the trench, is of yellow-brown clay with an admixture of fine sand. Potsherds and dark-coloured elements were found in it. The stratum is of great thickness on both sides of the wall W 2 and it seems probable that the sun-dried bricks of this wall provided the debris from which stratum 7 was formed.

Before the deposition of this stratum a pit (7 P) was dug on the southern side of W 1. Animal bones, potsherds and charcoal were found in the lower part of the pit.

Stratum 7¹. This stratum seems to be identical with stratum 7; its composition, depth and elevation are the same and the material is fine sand mixed with clay and cultural elements.

The stratum is rather thick and it extends over a comparatively large area. The upper part of wall W 2 provided most of the material which forms this stratum, but to judge from its thickness some material may have emanated from other walls in the neighbourhood which were destroyed at the same time.

Stratum 7 A. Between W 2 and H 7 b W was a cavity which was filled with earth which has later acquired a greenish tint. The cavity was in all probability filled in when the walls were destroyed. The cavity was filled in by a water-borne material, although wavy charcoal layers were laid down as were certain other materials. Thin beds of calcium salts and fragments of pottery and shells occur in the level.

Stratum 5 B. This stratum was deposited between the old walls W 2 and H 7 W and consists of green coloured clay mixed with fine sand, charcoal, grains of sand covered with gypsum and fragments of pottery. On top of the stratum is a bed of charcoal and other dark material which is some 5 cms. thick — this was probably a fire-place.

Wall H 7 W². It is probable that it was the upper courses of wall H 7 W which, having been destroyed during the monsoon season, provided at least some of the material towards the

accumulation of stratum 5 B. Whatever the case, the wall was repaired in the following period — the rebuilt courses being labelled by the excavators H 7 W^2 (fig. 32).

Strata 6—4. These three strata cover the whole of the excavated area and have their origin in the houses built more to the south than those which gave material to strata 8—5. Each of the three strata is about 10 cms. thick and each is distinctly separated from the other. Each consists of brownish-yellow clay mixed with fine sand in which are found charcoal, occasional dark patches and potsherds. Near the Ghaggar are some thin beds of calcium salts and some green patches.

Stratum 5 A. Fine sand, partly laid down by the current, predominates in this stratum, the sand being intermixed with fragments of red, burnt bricks. Dark-coloured elements occur frequently and patches of material with a greenish tint are also found. The stratum covers the charcoal above stratum 5 B.

The walls and buildings, which we have described above, were by this time covered and can hardly have provided the material for the uppermost levels of RM II; this must have been carried to this place from houses built higher up on the mound, and especially from houses to the west and north-west of the trench A more complete excavation could have produced the answer to this question. The greater percentage of eolian sand in the upper levels of the mound gives an indication of a drier climate. The configuration of this part of the mound and the inclination of the strata in that part of RM II that was not fully excavated indicate the probability of this theory. In this light we may presume that the inhabitants tended to move more and more towards the west and north-west and that the height of the mound in these areas is due to human agency.

Stratum 3 is of the same composition as the preceding strata and is between 10 and 20 cms. in thickness. There are three pits, or channels, in the stratum. A small pit (fig. 28) occurs in the southern face of the trench a metre and a half to the west of the eastern corner, a corresponding, though much larger, pit appears in the northern face of the trench about a metre and a half to the west of the eastern corner. There was another pit on the eastern face of the trench. They are all man-made. It was impossible to tell whether these were part of a system of drainage or if they were isolated holes excavated for the soil they contained. The two pits, in the southern and eastern faces of the trench contained the same material as the mother layer. P 3, the pit in the northern face of the trench had a more complicated infill. At the bottom is a bed of yellow clay mixed with fine sand, the rest of the infill consists of laminated layers of clay and fine sand These layers are of the usual yellow or brown-yellow colour. The pit is covered with a bed of clay and fine sand which contains potsherds. There can be no doubt that this pit contained running water but the conditions under which these layers were deposited are not evident. The length of this feature could not be determined owing to the incomplete excavation of the site.

Stratum 2^1. This stratum was laid down at roughly the same time as stratum 3 and consists of a brown-yellow clay mixed with fine sand. The stratum also contains thin layers of calcium salts, charcoal and pottery.

Stratum 2 consists of clay mixed with fine sand. It is up to thirty centimetres thick and shows distinct signs of running water. In the western part of the stratum potsherds are of common occurrence, while in the eastern part they are almost completely absent. Plant remains were found occasionally in the stratum.

Stratum 2² was deposited to the east of wall H 7 W. It consists in the main of fine sand, although there are many traces of habitation. Traces of running water occur frequently throughout the level. There are a number of thin beds of calcium salts and many potsherds occur in the stratum. The stratum is covered by a bed of clean, fine sand which must have been deposited in stagnant water.

Stratum 2 A. Over these culture layers are a number of beds of fine sand and clay which contain some charcoal and potsherds. These beds were laid down by running water.

The Ghaggar. During the later periods of settlement at Rang Mahal the amount of accumulation in the river bed was small — the mound grew a couple of metres while the increase in the height of the river bed was only about 20 cms., and most of this material was eolian sand. As we have seen, this is due to the fall in the water supply to the Ghaggar.

It is clear therefore that Rang Mahal was inhabited for a considerable period after the Ghaggar had virtually ceased to carry water. The last inhabitants of Rang Mahal enjoyed a climate similar to that which pertains today.

Stratum 1. The mound is covered with fragments of pottery, brick and other materials — animal bones, ornaments, etc. — and (if modern inhabitants of the area have not got there first) a number of ancient coins. Remains of plants can be found. The cavities of the surface are filled with such material and with fine sand which was laid down by running rain-water.

The form of surface is common on all old mounds in the area, resulting, as it does, from erosion by wind and rain. It is probable that only a few houses remained on the mound at the time when the settlement was abandoned. Gradually the ruins of the deserted houses were destroyed; the fine, light material, emanating from the houses and from the surface of the mound, was blown away. Only those materials which were resistant to the erosion of wind and water remained. After a time the surface of the mound was removed leaving only potsherds etc. which formed a relatively strong cap on the mound and prevented further erosion. Although a particularly strong monsoon can still erode such a surface, especially on the steep sides of the mound, the cap preserves and protects the present configuration of the surface. The present surface of the mound is thus a few centimetres below the original level.

Stein (1942) has already earlier expressed about the same opinion, he writes (p. 176) "Such mounds, known locally by the terms THER or THERI (in the case of the smaller ones) are bare of all vegetation and covered with pieces of broken pottery; these mark prolonged occupation before the sites were abandoned. The long erosion by wind and rain has gradually brought to the surface sherds dropped at different times and embedded in varying levels. This thick cover of sherds makes these ancient mounds easily recognizable from a distance and well known to the people. It is not found where occupation has continued down to recent times or has been resumed later."

The excavation at Rang Mahal has, however, clearly shown that the hypothesis of a "prolonged occupation" must be discussed and that the later occupation has been of a very sporadic nature.

The westernmost part of trench II, named Q (fig. 26), was partly excavated but, owing to lack of time, it was never completely examined. It did however yield a certain amount of pottery, and to complete the description the following short report on the sequence of layers in this trench will be presented.

The north-eastern corner of part Q was situated 355 cms. above the level of the bed of the Ghaggar and 217 cms. above the fixed point of RM II (fig. 30). The trench covered an area about 2.5×1.75 ms. and reached a depth of 330 cms., a depth which corresponds to 15 D/11 C in the trench (RM II) to the east of it (this does not necessarily mean, however, that the layers were contemporaneous). It was not possible to arrive at any geological correlation between the layers in part Q and the layers in the trench RM II, partly because of the homogeneous character of the layers in part Q and partly because of the very limited extent of the excavation in this trench.

Fig. 32 illustrates the sequence of the layers at the northern face of the trench; this sequence is identical to that of the other faces of the trench. The layers are all more or less horizontal, indicating the gradual, uninterrupted deposit of material; only in the bottommost layers is there any indication of a deposition of material in running water. Three layers showed a greenish tint when freshly cut; two of these layers occur in close proximity to thick charcoal layers All layers, except VIII, consist of clay mixed in varying quantities with eolian material and refuse from the settlement.

Strata X and IX. These two layers were separated by a thin, dark line. Occasionally there is a slight indication of current bedding but in general the structure is typical of layers formed by the collapse of sun-baked clay. The layers contain a certain number of potsherds, charcoal and grains and streaks of gypsum.

Stratum VIII. This layer consists of almost pure clay which has a greenish tint when freshly cut. It seems completely free of potsherds and other admixed material, but charcoal horizons, a few centimetres in thickness, occur above and below the stratum.

Stratum VII. In the lower part of this layer large quantities of potsherds, burnt brick and bone fragments were found

Stratum VI. This layer is separated from the underlying stratum (V) by a thin, dark horizon It is unusually rich in thin gypsum lines and small potsherds.

Stratum V. The lower part of this layer consists of a charcoal deposit, a few centimetres thick, above which is a layer (5 cms. thick) which, when freshly cut, reveals a greenish tint. This layer was defined by a thin gypsum line. The greater part of stratum V contained a large amount of potsherds.

Stratum IV. A thick charcoal layer separated strata IV and V. The upper part of stratum IV has a greenish tint when freshly cut The layer contained large quantities of potsherds, burnt brick and charcoal.

Strata III, II and I. The three topmost layers are separated by dark lines. They contain comparatively little pottery and burnt brick. There are occasional thin levels which, when freshly cut, have a greenish tint.

The "Greenish Tint" in Certain Strata

Certain strata of both trenches, when freshly cut, revealed a slight greenish tint which eventually disappeared This coloration could be seen throughout certain levels, while elsewhere it appeared only in the upper part or as clearly defined patches (fig. 16) In pit 15, which was dug near the bank in the bed of the Ghaggar, a greenish layer was found at a depth of 75 cms (fig. 10).

Certain green layers were examined in order to determine their content of organic substances and particularly the proportions of their chromatophor pigments. To extract such pigments the samples were boiled in acetone

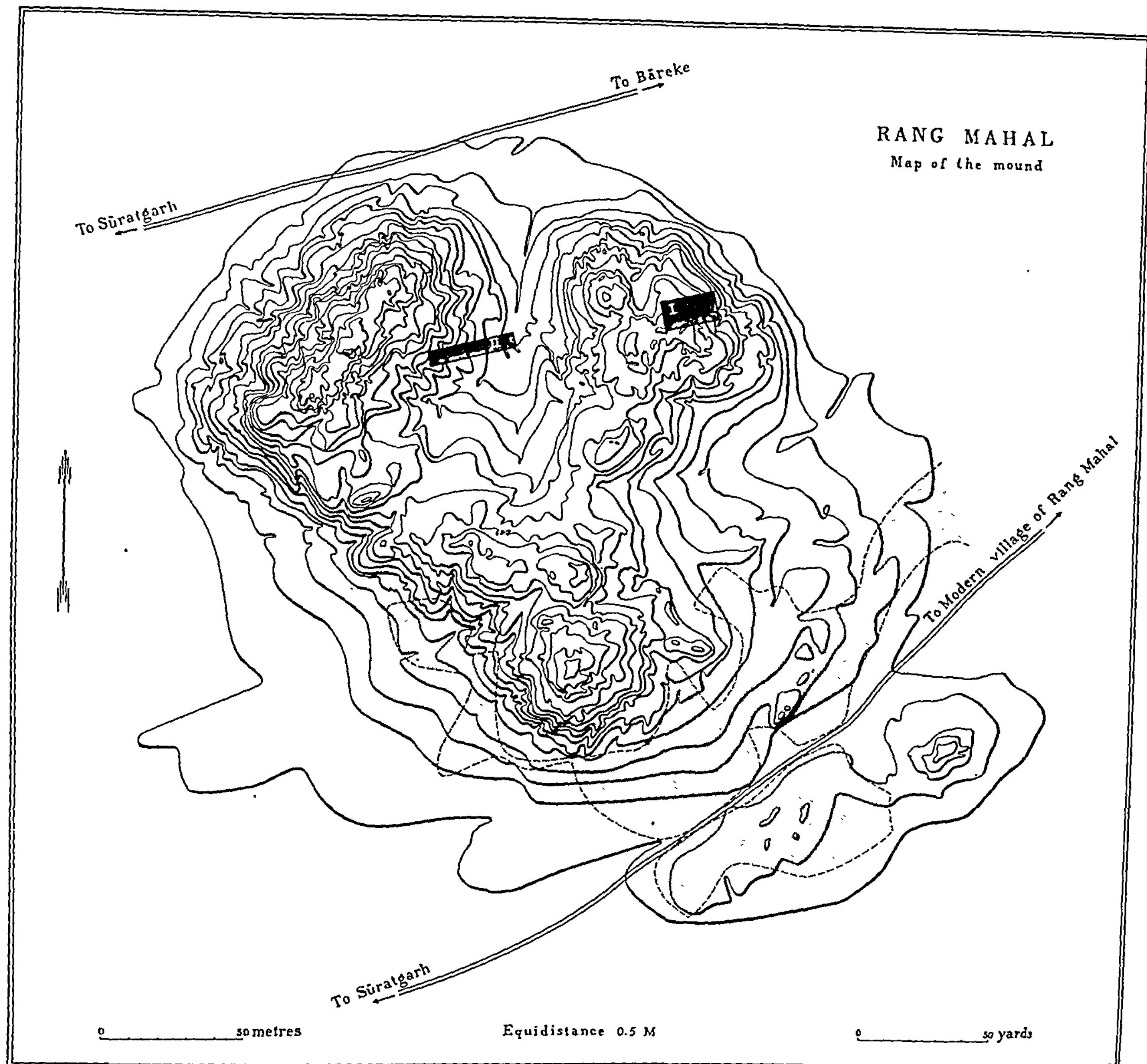


Fig. 15. Map of the mound 1 of Rang Mahal. The dark areas mark trenches I and II. The stippled areas mark eolian deposits. (*G.E.*)

over a water-bath.[1] Ultra-violet rays from a mercury vapour lamp with a wave length of 3300—4500 Ångström were then passed through the solution. The sample from the river bed showed a distinct reddish-purple fluorescence, as did two samples from the mound, although in these latter cases the colour was less strong. In certain samples from the mound no reaction could be detected. The more or less reddish fluorescence is believed to indicate the presence of chlorophyll in the sample.

The greenish tint, or part of it at least, seen at certain levels may be interpreted then as due to the presence of organic material containing chlorophyll.

If the results of these simple experiments are correct it seems reasonable to suppose that the chlorophyll originated in an algae vegetation of which now only some diatoms remain. The diatoms found in the mound may have come either from the river or they may have lived on human waste, primarily urine.

[1] *Kolkwitz*, 1935.

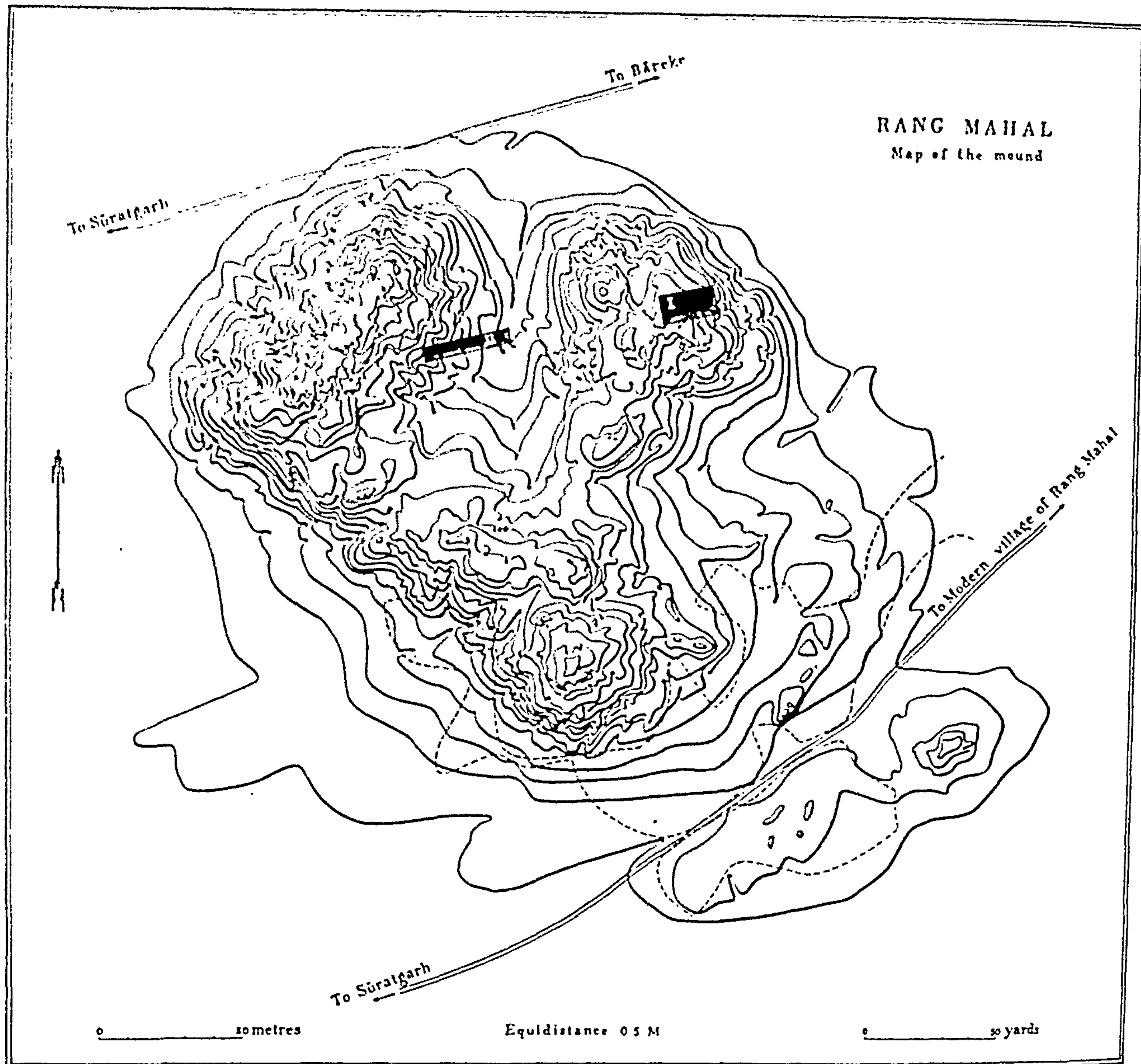


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Today there are lots of algae (mainly green algae) in the reservoirs which many villages must have to control their water supply. These tanks consist normally of pits where monsoon rain is collected.

The examination of certain samples from the mound revealed the presence of diatoms and a number of silicated pieces of plants of a higher order A fragment of a diatom, found in one of the samples, is presumably an *Amphora.* The examination of a few samples from the river bed did not, however, reveal any diatoms.

The "Gypsum Layers". Between some of the layers in the mound, and very occasionally within the layers themselves, are streaks or thin horizons of a composition that will be analysed below In a freshly cut section these appear with a white or grey-white colour. In thickness they vary between a couple of millimetres and a few centimetres; while horizontally they may measure anything from a few decimetres to a number of metres. They always lie in the same plane as the layers above and below them.

These streaks, which have been referred to in this publication as "calcium salt layers" or "gypsum layers", often lie on top of, or in close relation to, a horizon of charcoal or ash pl 8:3 and they are almost invariably formed in association with a habitation layer Certain of the streaks, or layers, have an undulating profile. It is noticable that the gypsum layers are not disturbed or crushed, but are completely intact, despite the fact that they are sometimes very porous in structure.

A chemical analysis of a gypsum layer in trench RM I gave the following values, expressed as a percentage of the whole:

SiO_2	64 00 %	Na_2O	1.17 %
Al_2O_3	10.33 %	K_2O	3.42 %
Fe_2O_3	3 74 %	P_2O_5	1 02 %
MgO	2 11 %	SO_3	1 90 %
CaO	4 72 %	CO_2	Only traces, demonstrated qualitatively

This analysis gives, *inter alia,* in terms of minerals, 36 % quarz, 43 % felspar, 3 23 % gypsum and 2.46 % apatite.

These results show that it is the salts that give the horizons their light colouration when newly cut

We may possibly explain the origin of such horizons thus on a settlement site the earth receives a great deal of water from households etc, especially in the neighbourhood of fireplaces and dwelling-houses. This water holds in solution a considerable quantity of soluble salts, *inter alia* salts of sodium, calcium, chlorine and phosphorous. In a dry period these salts crystallize out on, or very near, the surface of the soil, to form a relatively hard crust. It would seem that it is part of this crust that forms the "gypsum layers".

These gypsum layers also serve to demonstrate the topography of the surface of the mound at the time when they were laid down.

TRENCH I AND ITS BUILDINGS

Trench I was laid down on the easternmost mound of the group which forms Rang Mahal (fig. 15). The x-axis (east/west) extended from x=+20 to x=+39, zero being to the east at the foot of the mound. The trench was started on the slope of the mound, instead of at the foot, as it was evident that the lower stretches of the slope were damaged. It seemed more probable, therefore, that fairly well preserved remains of the settlement might be found in the central portions of the mound.

The top soil and the highest layers of the trench were disturbed and uneven; these disturbances were mostly caused by Mohammedan graves on the top of the mound and no very extensive damage seems to have occurred (p. 185).

The main section (fig. 19) was drawn from the southern face of the trench and stretched from x=+20 to x=+39. A wall at surface level at x=+39 (p. 79) and the remains of houses beyond this point prevented the trench being extended further castwards to any great depth. The sections, which are illustrated in fig. 19—21, are not schematized but show even the smallest irregularities and horizons. The mound consists mainly of clay from collapsed houses built of sun-dried bricks. The remains of the house foundations of the different periods are divided from each other by a series of layers of clay, sand, charcoal, gypsum etc. As a rule these layers extended over small areas and were fairly irregular. It was impossible therefore to trace these layers over large areas of the trench. The layers were mostly horizontal, save where they curve downwards over an older pit. For this reason, and because there was a risk that levels might be invented which did not in reality exist, if the excavation attempted to follow the natural layers, the trench was dug in a series of uniform layers, each 30 cms. in depth. An exception was however made to this rule where clearly defined and limited layers occurred. Save in the westernmost part of the area, A^{v}, and where it was necessary to preserve the foundations of certain houses, the trench was excavated to the lowest level at which traces of settlement could be found. At one point (x=29—31.) a small trench was carried down to natural soil and further drilling in this trench added a geological series (fig. 10).

The sequence below the level of primary settlement in this trench was as follows (fig. 19).

a) Greyish-white fine sand mixed with clay, closely packed, containing deposits of white clay. The sand was of a fine, even size of grain. 80 cms. below the lowest level of the main trench a few small, unidentifiable potsherds were found.

b) Yellowish-brown fine sand mixed with clay, of a crumbly consistency. The newly cut section had a shiny appearance. Shells also occurred at this level.

c) A poorly defined horizon of charcoal-less ashes.

d) Brownish layer of fine sand, clay also occurred but decreased in quantity towards the bottom of the level. This stratum was closely packed and a layer of fine, alluvial sand occurred some 10 cms. from the surface. Scattered fragments of burnt clay and brick were also found.
e) This shallow layer consisted in part of slightly burnt clay and partly of ordinary fired bricks. Above these were burnt nodules of clay from layer d. A few pieces of charcoal were also to be seen.
f) Greyish-brown fine sand, mixed with clay, with a few small pieces of burnt clay. Thin strata of ash and gipsum were found, and the layer was seen to be faintly stratified in places: certain water-layed sandy deposits were identified.
g) Two solid gypsum layers containing small pieces of burnt clay and a number of unidentifiable, red potsherds.
h) Thin charcoal layer lying above a closely packed layer of small, undecorated and unidentifiable sherds of pottery.
i) The same layer as f, save that here it was clearly water-layed. The layers f and i formed a continuous layer interrupted by the layers g and h.
k) Grey-mottled, fairly heterogenous, water-layed level with scattered ash, charcoal and clay. Certain, largish portions of the clay were burnt.
l) Level of charcoal and ashes. The sand of this level was fine-grained, it was black in colour and contained small pieces of charcoal, scattered, small clay nodules and gypsum sediments.
m) Greyish-white sand layer streaked with gipsum. The level contained scattered pieces of charcoal and burnt clay.
n) A well defined charcoal level consisting of two marked charcoal stripes on either side of a layer of black-brown, fine-grained sand which contained small nodules and minor charcoal particles. Very faint gypsum sediments were also seen.
o) Yellowy-brown, alluvial layer of sand, mixed with clay, and thinly striped with ashes and gypsum. The layer, which was of fine-grained and even texture throughout, contained shells, pieces of charcoal and burnt clay and some small, unidentifiable potsherds.
p) A solid black layer. Under the larger pieces of charcoal were found clearly defined stripes of gypsum sediments.

Ash and charcoal deposits penetrate layer o from the sides towards the centre and are followed by gypsum sediments (cf. the charcoal deposits in the higher levels).

The earliest sherds of pottery occurred in layer a, but small, undecorated sherds of this type are found scattered over wide areas of the plain outside the mounds. It is very doubtful whether these potsherds, or the charcoal layers recorded in this pit, can be taken as evidence for continuous settlement on the site. The stratifications of the layers and the fine-grained sand, would make it reasonable to suppose that these layers were deposited in the river, or at the rivers edge, and that the contemporary settlements were situated elsewhere, further away from the river. The homogeneous layer e, which contained fired clay and burnt brick, is probably refuse, cut away or washed away from a ruined building further south.

Eight strata, each representing a separate phase of building, were distinguished in the mound (the first traces of settlement being found 4.75 m. below ground level). Houses were destroyed and rebuilt at different times and in different areas of the site, the settlement site can not there-

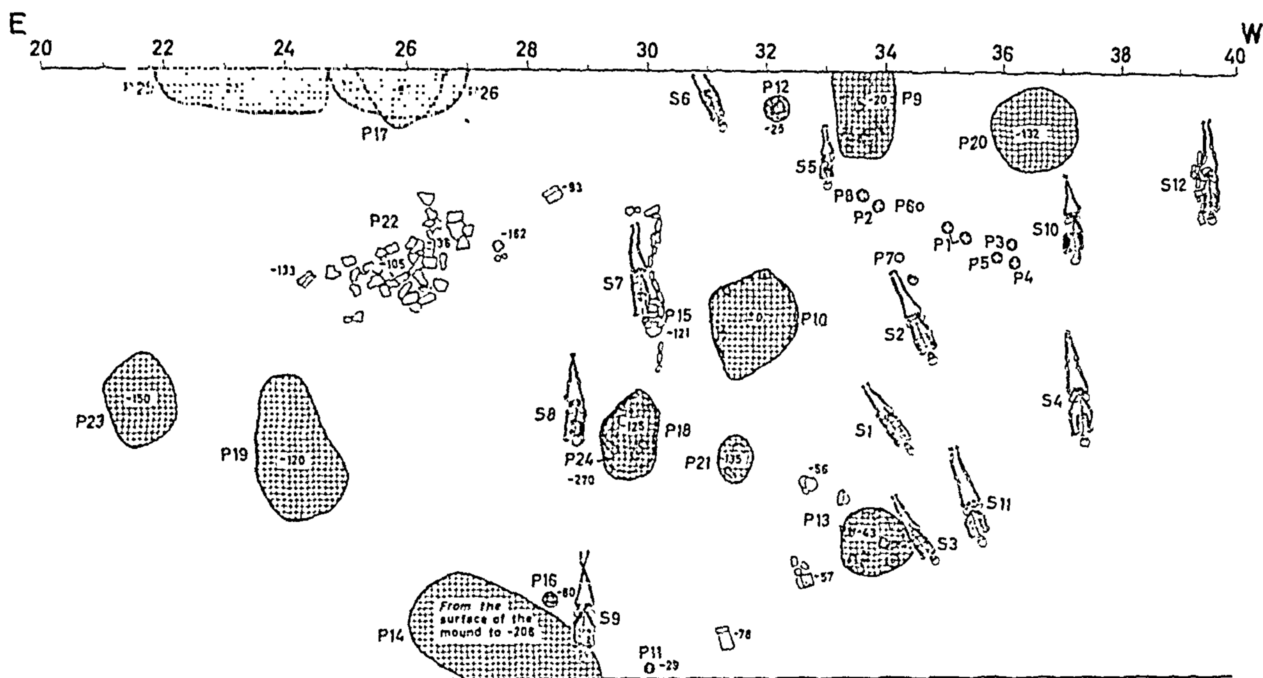


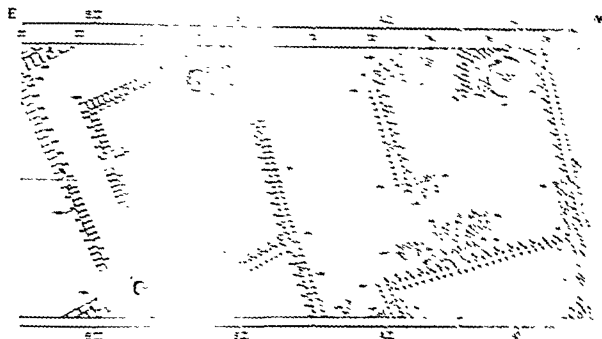
Fig. 17. Trench I. Mohammedan graves and the pits. (*H.A.*)

fore have remained level; as a result houses belonging to the same period can be found at varying depth of the mound. The numerous layers and variations in the sequence illustrated in the section (fig. 19) demonstrate clearly that the mound did not grow regularly in height; each horizontal layer does not represent an epoch. A detailed description of the variations in the sequence of layers would be both tedious and useless. The trench has therefore been divided into strata based on the house foundations in the trench. It must be emphasized however that these divisions do not have any chronological significance in relation to the other parts of the mound.

The trench was divided into two squares, A, the western from x=+30 to x=+35 — the westernmost part from x=+39 called A^V — and B, the eastern from x=+20 to x=+30. From layer G downwards A was divided into two and B into four subsquares, see fig. 18.

Stratum I produced the earliest traces of building. Portions of houses, which could be assigned to this level were house A, (fig. 18) in the south-east (main section fig. 19, point 20—22.5), and presumably house B (fig. 18), represented by a low-lying portion of a wall which was later incorporated in house C, and house F (fig. 18, pl. 5:1). House F must have belonged to this level as a portion of its western end was demolished when wall G was built. In the main section, at point 33, a heavy clay layer can be seen beneath wall G; this layer presumably represents the southern wall of house F which was razed before the building of the later wall. The dark charcoal deposits which, running under house C, rise up against this layer of clay and the walls of house F, were formed during a period when all the walls of house F were still standing above ground.

All houses in this stratum (and in II) were built of sun-dried bricks. The bricks varied slightly in size between 32—36 cms. in length, 22—25 cms. in width and 6—8 cms. in height; the normal size was about 32×23×7 cms. In each course one row of bricks was laid along the length of the wall and another crosswise so that the bricks in the two rows were at right angles to each other, thus



[illegible]

the walls always [illegible]. As far as could be seen the walls were not [illegible] the courses were [illegible] so that the bricks placed along the length of the wall appeared on the exterior in [illegible] more in the next one, as might have been expected. In the lower courses, on the [illegible] face of the wall of house F (pl. [illegible]), in which the bricks lie lengthwise along the wall, the [illegible] were so placed that the vertical jointing of one course did not coincide with the vertical jointing of the next course. In the uppermost surviving course, however, the position of the bricks within the course was reversed so that the row of bricks along the length of the wall appeared on the western face. Another unusual feature of this house were the very wide bricks which appeared in its northern wall (fig. 18).

The sun-dried bricks are usually manufactured from a brown clay, with the exception of house F where there were alternate courses of brown and pale yellow bricks, the walls thus has a striped, decorative appearence which was presumably intentional (pl. 7:2). House F was however never completely excavated as it was not desirable to remove the remains of a house and a floor of burnt brick above it.

A large storage vessel, a, in the northern part of B14 belonged to level I (pl. 5:1); it was buried upside down and was dug down below level I into the underlying charcoal and ash layers. The vessel was coarse, undecorated and egg-shaped and its base had been cut off to form a wide mouth. In its present state the vessel is 54 cms. high and 53 cms. at its greatest diameter. The walls are about a centimetre thick. No stones or other features were found in or near the vessel.

Another large storage vessel, b, buried in the south-eastern part of B, belongs either to this level or to level II (pl. 5:2—3). The base of this vessel had also been cut off, but in this case high up, at the point of greatest diameter. The vessel (pl. 70) was then turned upside down and sunk in the ground, the original opening being covered by a coarse basal fragment, presumably

the original base of the vessel (fig. 22). In its present state the vessel is 66 cms. high and its maximum diameter is 78 cms.; the walls are about one-and-a-half centimetres thick. A pavement of fired tiles (pl. 5:3) led westwards from this vessel, increasing in width as it proceeded. The pavement consisted of two rows of tiles, decorated with a series of grooves, two to four in number; these grooves were made by the fingers before firing. Brick fragments were placed along the edges and between the tiles to form a level surface. The pavement continued beneath the wall C 6 and is therefore earlier than the wall (fig. 22). The relationship of the storage vessel to the walls C 1 and C 2 is however somewhat uncertain, as the walls could not be traced down as far as the level of the upper edge of the vessel. It is possible however that the hard clay packing underneath the walls (in which no bricks can be distinguished) may be a specially laid foundation for the walls; if this is so the vessel may be contemporary with walls C 1 and C 2. This would explain its position in the angle of the two walls (pl. 5:2). The possibility that the vessel was part of an earlier outdoor feature, which was later enclosed accidentally by the walls, cannot be excluded.

Stratum I corresponds to the excavated layers 13 and 14.

The fabric of the pottery found in this level was usually of fairly coarse quality, but at the bottom of layer 14 a number of fragments of sprinklers, with burnished surfaces, was found (pl. 49—50). Decorated potsherds were very scarce, most of them had geometrical patterns, one a bird (pl. 36:1).

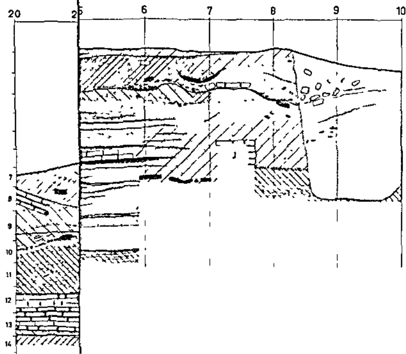
Stratum II is represented by the houses C, D and G (fig. 18). House G was only partly excavated; a large portion of the building had disappeared and the walls could not be followed further westwards owing to the presence of wall K at a higher level.

No clear distinction can be made between the walls C and walls D (pl. 6:1), they are probably not all contemporary. Owing to the condition of the sun-dried brick it is not possible to determine whether the various walls are bonded together or not. The southern wall of house D is not, however, bonded together with the wall C 1 (fig. 18), it is built up to it — a later addition. This does not necessarily mean that there is any great difference in date between the two buildings. It does seem probable however that some time elapsed between the construction of the two walls, as a protruding portion on the lower part of the southern face of wall C 1 ends at the point where house D begins.

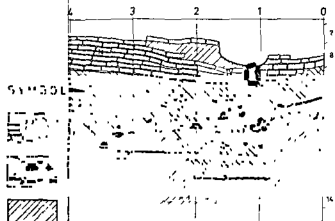
The section (fig. 19) seems to indicate that wall C 6 was still standing to an appreciable height when wall C 1 had collapsed. It is possible, therefore, that the storage vessel b is related to the angle of the walls C 1 and C 2, and that wall C 6 (which must be later than the paving in front of the vessel) is a later addition to the other C walls. But it is not possible to ascertain with any certainty the different relationships of these walls. The rooms of house C were apparently very small and no doorways were found, but these may have occurred at a higher level. All we know of house D is that it had at least two rooms. These houses were built of sun-dried bricks which vary slightly in size; they were built in a similar manner to that of the earlier houses A, B and F.

The method of brick-laying varies in wall C 4 (pl. 6:2); at the southern end the bricks lying along the length of the wall are on the westwards, presumably internal, face, while at the northern end these bricks face eastwards, towards the outside of the house.

Only a short stretch of the wall of house G survived within the excavated area. All the bricks are laid lengthwise along the wall.



section at x = +35 (H A)



he estern wall of house N (H A)



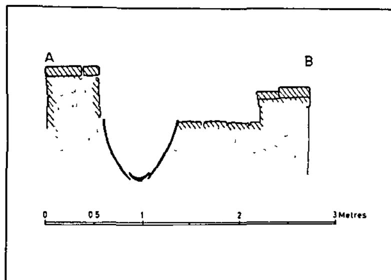


Fig 22 Trench I Section of the storage vessel b (*L H*)

Although house F may have belonged to a somewhat earlier phase than house C, it is clear from the occupation layers, that at some stage they were contemporary The existence of a street between the houses is indicated by the shape of these layers, which rise up towards the walls of the houses from a dip in the middle (fig 19). Today refuse is deposited in exactly the same way in a street in the small desert villages — the trafic moving in a hollow in the centre. A broad street (5 m. wide) with its refuse gradually deposited at the sides, can clearly be seen in the main section (pl. 19) between points 27 65 and 32 60 In this area the layers 10—12 represent the period during which houses C and F were occupied, house G built and house F seems to have been demolished. Outside this area (in the squares BI, BII and BIII and in those eastern parts of A where the excavation reached this level) the layers were fairly undisturbed and we may presume that the layers 10—12 here belong to the period represented by the houses C, D, (F) and G.

In the square B IV however conditions were different and only layer 12 can be assigned to the period of houses C, D, (F) and G. The main section (fig. 19) showed, between points 22 40 and 24.80, large quantities of clay, which undoubtedly belonged to a demolished house, probably house A. At the same time part of house C collapsed; wall C 6 remained standing while C 1 was destroyed. East of wall C 6 a pocket, which stretched towards the collapsed clay mass of house A, was formed over the collapsed parts of wall C 1. This pocket (Pit 26), and particularly its eastern part, was used as a refuse dump (fig. 23).

Pit 26 contained of a compact layer of potsherds, mixed with soot and ashes. This deposit was concentrated within the area shown on the plan (fig. 17). It did however extend, in a less compact form, outside this area, particularly to the north, partly covering wall C 1, which had collapsed at the time when the area was used as a dump.

The top of Pit 26 is in B 10 but it continues down through B 11. Scattered potsherds and charcoal found at the pit connect it with a heavy concentration of potsherds and a number of complete bowls (fig. 23) desposited in the clay sand stratum in the south-east of B IV (fig. [illegible]).

The finds from stratum II are mainly of the same character as those in stratum I.

Stratum III. The delimitation of this level is more difficult. The layers, which may be assigned to this phase of building, were primarily characterized by the irregularity which resulted from pits and other intrusive disturbances. The houses were thoroughly demolished, and often the presence of a building can only be detected by means of the compact clay strata which were produced by the levelling of the building. The constructional details are almost completely lost. Although certain wall fragments probably belong to this level, they cannot be so ascribed with any degree of certainty. We have already seen that house G may have been built at the time when level II was formed, but it was perhaps also occupied during the time represented by level III. It also seems likely that the wall fragment H (fig. 18) can be assigned to stratum III. Traces of a house, the walls of which could not be followed, can be seen in the north-south section at x=+35 (fig. 20) between the points 1.75 and 4.60. The remains of this house were only apparent when the section had dried out and its relationship to other buildings in this area is obscure. The remains of a wall, made of sun-dried bricks, could be seen in the eastern section (fig. 21, between 5 and 6.50). In the same section fragments of single rows of sun-dried bricks were also to be seen (between 4.50 and 5.50 and between 6.50 and about 8.30). These rows, which occur at various places in the trench, and which were often difficult to see, were obviously floors or pavements outside houses.

House J can be assigned to the strata III/IV. Certain walls of this house are exceptionally well preserved (pl. 7 and 8:4) in some cases as many as 12 brick courses remain standing, although elsewhere they are not so clear. The eastern corner of the house does not form a right angle (fig. 18) and to the west the wall runs underneath wall M (fig. 18): the relationships here are rather obscure. Traces of a wall, in the western section of the trench to the north of wall M, probably represent the western wall of house J, but this could not be definitely ascertained owing to the badly preserved nature of this area. It is possible furthermore that wall O represents the northern wall of house J, but again it is impossible to be certain. In the western part of house J the bricks, as shown in the plan, are square in shape. This is probably due to the fact that the northern face of this wall was in such a bad state of preservation that it was partly removed during the excavation. The bricks were thus cut away on one side producing the square shape, which can hardly be original.

A floor of burnt bricks (pl. 8:4) to the south of the house J was found, five courses from the bottom of the wall. This floor, which was slightly uneven, was evidently connected in some way with the wall. The unusually uniform appearance of this wall makes it unlikely that the wall was added to at a later date, when another house could have been built at a higher level. It is more probable that this brick floor represents a raised platform, outside the wall, leading either into a yard or into the street, for the use of those who lived in the house.

Stratum III corresponds roughly with layers B 8 and B 9, although it cannot be correlated thus throughout the whole trench. These layers are characterized by short, heavily defined charcoal strata, ash and gypsum streaks and numerous other disturbances (pl. 8:3).

In the southern part of the trench, between approximately 22 and 24.50 m. there is a fairly large pit, some 35 cms. deep (figs. 17, 19 and 23). This pit (Pit 25) begins just above B 9 and must therefore have been dug at the period when layer B 9 was laid down; it continues down through B 10 towards the top of B 11. The pit held a large amount of pottery, mainly coarse bowls and

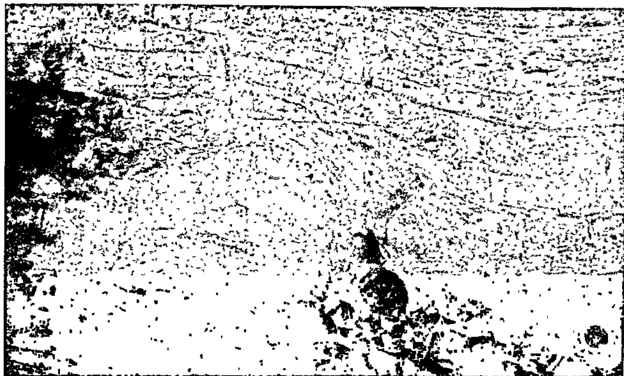


Fig 23 Trench I The pits 25 and 26 in the main section

jars, mixed with quantities of ash and charcoal A burnt brick, pierced with a hole, was found on the edge of the pit. A layer of very fine sand, in the upper part of the pit, lay mainly on top of the potsherds, which were found in a fairly hard packed mixture of sand and clay. A very well defined charcoal stratum running through the layer of packed potsherds may represent a fire on the site (fig. 19). Pit 25 containd e.g. the vessels pl. 18:7, 40 10, 64:19, fig. 46:26 and 92:6.

Pits 25 and 26 (fig 23) may possibly have been directly connected as part of the same rubbish dump. Pit 26 is situated to the west of and next to the collapsed walls of a house (presumably house A or a slightly later house close to A, see p 66). Pit 25 rests directly on top of the remains of these walls; a series of thin, unbroken strata stretch thence along the edge of the wall to Pit 26 (fig. 19). Furthermore some of the potsherds in Pit 26 form a slope against the top of the fallen walls. The strata connecting Pit 25 with Pit 26 can be described as follows:

1. Stratum of brownish-yellow, very fine sand mixed with a little humus (about 8 cms. thick). The stratum shows faint signs of stratification in the shape of thin gypsum streaks and is delimited by a well defined gypsum horizon.
2. Brown sand stratum (6 cms thick) with many thin, light stripes consisting mainly of clay and some gypsum These deposits are of a folded character, representing a very slow deposion in moving water. The stratum also contains scattered and fairly large pieces of charcoal (up to 1 cm. in length).
3. Fine, greyish-green sand with a completely even structure (10 cms. thick). As to the greenish tint see p. 61.

4. Embedded in stratum 3 is a layer of brown clay of folded structure of the same character as stratum 2. This stratum, which is almost vertical, was obviously deposited by water in a cavity, formed by disturbances in the decaying rubbish dump (Pit 25); water deposited on the surface trickling down into the fine sand of stratum 3.
5. Below these strata, and on top of the remains of the wall, a number of potsherds and fairly large fragments of charcoal (2—3 cms. long) were found. It is possible that they originally belonged to Pit 26 and were disturbed at a later date.

Pit 26 was obviously originally a separate rubbish dump next to the remains of the fallen wall. It was filled in, and owing to decomposition, the filling settled. Water then trickled down through a hole and carried charcoal and potsherds from higher levels which were contemporary with Pit 25. There is therefore some difference in date between Pits 25 and 26, although the difference need not be very great.

There is little difference in the pottery found in the two pits; coarse household vessels occurred most commonly.

The eastern extension of Pit 25 is cut through by a later pit. At the same level as Pit 26, between points 20 and 21 on the main section (fig. 19), a brown sand deposit was found containing humus, thin and irregular gypsum deposits, gypsum particles, charcoal and burnt clay; the western part of this layer consists almost exclusively of burnt clay. This deposit, which is a continuation of Pit 25, extended northwards as a layer of partly burnt clay and fragments of what are probably displaced fired bricks (fig. 19). The displacement of these bricks took place when the less clearly defined rubbish dump (fig. 19, 0.80—2.20) collapsed. This rubbish dump has been assigned to the previous level, but the significance of the burnt bricks cannot now be determined.

Stratum IV. The limits of this level are very difficult to define. In the southern part of the trench especially the surface was at this time fairly uneven, due to the collaps of rubbish dumps, pits etc. Houses found in this level were very badly ruined, and it was not possible to trace the layers with any certainty. It seems probable, however, that house J was used for a longish period and that it was still standing when the lower parts of stratum IV were formed.

Traces of houses were, as a rule, too tenuous to allow any reconstructions to be made. Traces of walls occurred at various places between 4 and 5 meters in the section (fig. 20). Other unindentifiable traces were found in the middle of the trench.

House N, (pl. 5:1, fig. 18) situated in the eastern part of the trench, can presumably be assigned to this level; it was found on the slope, fairly near the surface, and its eastern end was completely missing as the mound had been quarried away at this point. In certain places, and especially in the southern part of the trench, the wall has been deformed by subsidence. House N was founded on the levelled remains of an older building, and was built in the same manner as the earlier houses, of sun-dried bricks laid in different directions (fig. 18). The variations in the height of the wall result in a strange distortion of the plan, the variations seen here (fig. 18) are not, as in wall C 4, due to changes in the pattern of brick-laying but to the different courses being incomplete.

Traces of a wall, between points 20 and 20.50 (fig. 19), became visible as the section dried. It appears to be contemporary with house N, but its relationship to it is obscure; it is most probable that this wall was part of a house situated further to the southeast.

In house N, one metre from the eastern face of he trench, a small, quadrilateral niche was found, .

formed of four, fired bricks of varying sizes (pl. 5:1 and fig. 21). This niche backs against the wall *(made of sun-dried bricks) and was 20 cms. deep, measuring 12×20 cms. internally.*

Stratum IV is in the main equivalent to layer B 7 which had, however, been damaged in certain parts by later digging; for example by the large pit (14) in the north western part of the trench (section fig. 25), which was dug from the surface of the trench to stop just short at layer B 8.

The pottery found in layer B 7 was mainly of coarse character; painted pottery was also here rather scarce and when it did occur, it was generally decorated with simple, geometrical patterns. The food bowls were often coarser, smaller and less well-made than those found in the higher levels. Below the northern part of wall N two glazed potsherds were found (see p. 136).

This layer also contained several well defined ash and soot deposits, but these are neither very extensive nor continuous. This is demonstrated particularly well in the south-eastern part of the trench (between 33.5 and 35 m of the main section fig. 19) where a grey layer of clay mixed with sand, containing gypsum particles, merges (at about 33.5 m) into a marked deposit of charcoal and ashes which is, in places, as much as 20 cms. thick. This deposit runs under the wall, which could be seen in the main section (at 34 m.) but which could not be traced elsewhere in the trench. Broken ash and charcoal deposits occur at the same level in the north-south section at x=+35 (fig. 20). A pit, covered by sunken ash and charcoal deposits, could be seen in this section between 2.40 and 3 m . no artefacts of any importance were found in it. Related to these charcoal deposits were a series of gypsum deposits which cover large areas and follow all the uneven contours of the ground (fig. 19—20) We cannot say whether the heavy charcoal deposits between 3.50 and 6 m. in the section at x=+35 (fig 20) should be assigned to this level, nor can we say whether the lowest deposits belong to an earlier stage Traces of a wall were found in this section between the points at 5 and 6 m (fig 20); it was impossible *to follow the wall in its horizontal* plane. The wall lay on top of a charcoal layer, which ran above the paving of burnt brick between the points at 5.9 and 7 m., but which did not reach the wall of house J. It was obvious from this that house J must still be standing when the charcoal layer was formed.

The limited area covered by these charcoal and ash deposits makes it improbable that they result from conflagrations, it is more probable that they represent fireplaces and hearths which were in use for long periods. This interpretation is supported by the concentration of the deposits in certain areas. The fine charcoal particles and ashes embedded in the deposits in other parts of the trench may best be explained as material carried from the hearths by wind action.

Stratum V. This level consists mainly of fine sand and green clay intersected by thin gypsum deposits, often formed in considerable number one above the other (pl. 8:3), which were obviously deposited slowly and perhaps in water Numerous, thin charcoal deposits also occur as do the remains of some houses, which were unfortunately too damaged and insignificant to trace in their entirety. Between 33 65 and 34 m. in the main section (fig. 19) a wall was found which, probably running in a north-south direction, was laid almost directly on top of the charcoal deposit in layer B 7. As the main section dried out a new construction became evident between 26.25 and 30 m.; it consisted of a paving of sun-dried brick and a wall, this latter (between 27 and 28 m.) appears to be incomplete as it is only one brick thick. We could not determine whether it represented the wall of a house or, as is more likely, some other type of wall (e.g. an enclosure wall). It seems to belong to a late stage of stratum V and be contemporary with the large pit (see below).

The fact that house N was destroyed before the period represented by level V is demonstrated by Pit 23 (fig. 17). At the bottom of B 6 and at a depth of 150 cms. a compact deposit of potsherds, mainly food bowls, was found. The sherds were mostly small and worn, showing that they had been exposed and trampled on; they were not placed in a real pit, but rather in a pile on the surface and above the wall of house N, which consequently must have been in ruins by that time.

At the same level, some two metres away to the south-south-west, another isolated group of potsherds was found; in this case however they were not trampled upon. No pit could be traced but the soil round the sherds was very loose. They were obviously related to the burnt bricks and sherds of Pit 22 in layer B 5 (see p. 75) and must be considered as belonging to a higher level.

In B 6, but bordering on B 5, a small group of vessels were found (Pit 21) lying in a small heap, but without any trace of the pit itself, and with no admixture of charcoal and ashes.

A disturbance of uncertain origin in this layer begins at x=30, y=5.40 and stretches northwards. Solid clay deposits, in the northern part of the trench, represent collapsed walls. At y=5.40 a distinct dividing horizon was found which sloped downwards (fig. 24). The layers were here broken by a cutting (50 cms. deep) from layer 5 down through layer 6 (i.e. through stratum V); the northern extension of this cutting was not clearly defined. At the bottom of this cutting (Pit 24) a large number of potsherds were found, some of which represent large, globular vessels (pl. 8:5). Immediately above these sherds was an ash and charcoal deposit which covered the whole cutting. The layers here are horizontal and seem to have been formed above ground and not in a pit. Between Pit 24 and Pit 18, which lies higher up (p. 77), there was a deposit of brown clay and sand, 25—30 cms. thick (fig. 24).

The big bottle-shaped pit (1.60 m. deep), which can be seen in the main section (fig. 19) between 30.40 and 32.60 m., must also be assigned to a late stage of level V. The pit was cut by the main section and its side ran parallel with it some 10 cms. into the trench. It was mainly filled with fairly coarse sand mixed with clay; a number of very marked charcoal and ash deposits, which in some places were almost pure white in colour, appeared in its upper levels. At the same height, but more frequently further down, were distinct, pure white gypsum horizons which contained mainly chaff and straw. This pit must be interpreted as some sort of storage pit.

Stratum VI. House foundations in this level, at the southern end of the trench, could be distinguished in the section (fig. 19) but not horizontally in the trench. The house foundations also occurred in the western part of the trench, where conditions were very complicated.

In the main section, between 27.15 and 31.50 m. (fig. 19), a single course of sun-dried bricks could be seen, this may be related in some way with the brick in the same section at 32.50—33.20 m., but no definite connection could be established. At 30.50—31.10 m. in the same section a wall rested on this pavement: both pavement and wall had subsided here owing to the underlying pit.

No other walls can be assigned to stratum VI. The large number of thin gypsum deposits, between 30 and 35 m. and further west (fig. 19), together with the wind blown soot (which contains no large amount of small charcoal particles) may indeed indicate that this area was uninhabited for some time. These layers are partly water-laid, and the very close stratification, which can clearly be seen in pl. 8:3, would perhaps suggest that the area lay untenanted for at least one rainy season.

After the rains, the water would collect in the hollows and would evaporate, leaving gypsum and salt deposits, while soot would be carried there by the wind from nearby outdoor hearths.

Pit 19 (fig. 17) and its immediate surroundings was another area which was not inhabited for some period of time. It consisted of a thick (about 15 cms) deposit of potsherds covering an area of about 2.25×1.50 m., surrounded by a thinner scatter of potsherds stretching at least a few metres away from the central area. The sherds were mostly small, worn and trampled on, and it is evident that the broken pots have been thrown into a heap which was frequently walked over. As similar sherds occur over a large part of the eastern portion of the trench, this area must similarly have been free from houses. Pit 19 lies at —120.

At a higher level (—0 80 and —0.90) a similar layer of trampled potsherds (Pit 17) was found in the southern part of the trench from x=25 to x=27 (fig. 19); the layer also contained a fired brick. This collection of sherds must probably be assigned to stratum VI; it is at about the same level, or slightly lower, than the sun-dried brick paving Pit 19, however, was at a lower level and may perhaps belong to a late phase of level V It is impossible however to date it for, as we have already seen, the height of a feature in the trench need not necessarily be indicative of its date In the area to the west of the pottery dump (Pit 22), mentioned above and assigned to level V, the remains of a collapsed and levelled wall of sun-dried brick could be distinguished, it could not however be traced any further Close to the remains of this wall (at x=28 50, y=2), two burnt bricks were found, standing on end and forming a kind of niche which in some way was related to the wall (cf. pl. 6:3, see p. 77); the tops of the bricks were at a level of —93 and they measured 39×26×10 cms. and 38×25×7 cms.

In the east, a heap of broken, burnt bricks was related to Pit 22 — not a single complete brick was recovered from this heap, which stretched from —105 to —136. Sherds of broken food bowls were scattered among the broken bricks; the whole deposit must be interpreted as a rubbish dump

The above mentioned gypsum deposits, which were most clearly seen in the main section between 30 and 35 m., were also noticable in the north-south section at x=+35 (fig. 20). They were very distinctly visible in the lower strata of level VI (pl. 8:3), below layers which consisted mainly of collapsed walls. Only one standing wall (between approximately 0.40 and 1.75) could however be distinguished. This wall represents the eastern face of wall K, of which sixteen courses remained (see below).

To the west of the north-south section at x=+35 was an area which we labelled A^{V}. The relationship of the various walls in this area to each other and to the different building periods could only be partially ascertained. It is obvious that differences in level occur between this area and that which lies further to the east.

Wall K (fig. 17), which starts immediately above a white gypsum layer in the lower part of level VI and reached a level of between 0.08 and 0.13, could only be followed for a few metres lengthways. Owing to the numerous gypsum layers, between the posthole (?) at 2 25 m. and the point 6 m. in the section fig. 20, it is unlikely that wall K extended further than the 2 metre line in this section

Another wall, L, in the southern part of A^{V}, runs into the section at an oblique angle; it is on the same level as the lower part of wall K. The upper courses of the wall were removed by workmen, so its present height (at —0.52) is not original.

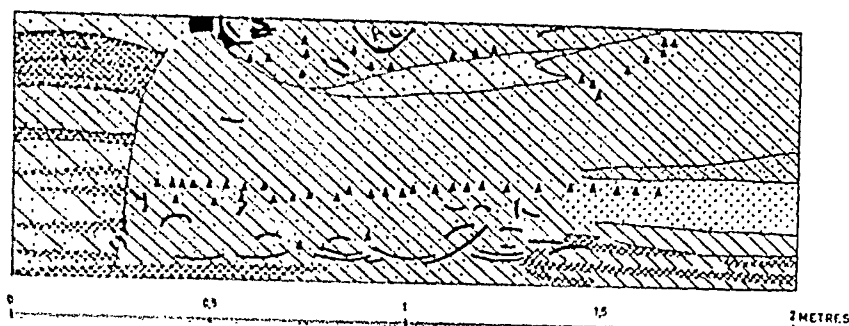


Fig. 24. Trench I. The pits 18 and 24. (*H.A.*)

Two small bricks on top of each other (L[1]) protruded northwards from this wall at —36 and a similar feature (L[2]) protruded westwards from wall K. Between these two features was a large, circular pit, Pit 20, of cylindrical shape (pl. 8:2), 140—145 cms. diameter and with a bottom 67 cms. below that of the protruding bricks. The sides and bottom of the pit were firm and covered with a layer of clay. It was filled with broken pots, many of which were large and had a painted decoration.

In wall K, between wall L and protruberence L[2], was a niche with a frame about 20 cms. wide and 3 cms. deep (pl. 8:1). The niche opened in the wall at an oblique angle which was parallel to the direction of wall L; it was 30 cms. deep. The eastern wall of the niche was formed of collapsed sun-dried bricks and the features of the construction were unclear. Two very badly damaged clay animals, a small wheel, a reel-like object, a clay ball and some potsherds (among which was a fragment of a sprinkler) were found in the niche, mostly near its opening.

A terracotta head (pl. 72:5) was found immediately outside the niche. To the north of the niche, in wall K, were found three coins (p. 175), the southernmost inside a brick and the other two in cracks between the bricks. All the three coins were unidentifaible.

The angle of the niche in wall K and wall L can hardly be coincidence, and it is further remarkable that the direction of wall K differs both from that of the walls of lower levels and that of the later wall M. Owing to the short length of the wall that survives this phenomenon cannot be interpreted. It is conceivable that wall K did not form part of a building (no other walls that could have belonged to such a building were indentified), it could possibly have been a part of a fence wall, which would explain its north-south orientation. In that case the niche was in the open and wall L and the protruding bricks (L[2]) formed some sort of addition. Pit 20 is probably best interpreted as a pit for ritual offerings related in some way to the niche. At the bottom of the pit were two undamaged pots (pl. 43:1, 53:2); the rest of the pit was filled with sherds of broken pots, many of which could be restored; some of these pots are among the largest and most magnificent examples of painted ware from Rang Mahal (pl. 16:3, 17:1, 19, 20:1, 22, 23, 24, 26:4, 27, 29, 30, 32:1), but there are also many cooking-vessels e.g. (pl. 54:5, 56:2—3, 57:1, 8).

The relationship between walls K and L, the protruding bricks at L[1] and L[2], Pit 20 and wall M (fig. 18), which is situated on a slightly higher level, is difficult to interpret. Although it is obvious that the house, of which wall M is a part, was built at a time when Pit 20 was filled in, it seems probable that walls K and L may still have been standing at the same time — at least in

part — as the highest point of wall K is quite beneath the surface. It is of course natural to presume that, in a community of this sort, with small clustered buildings, certain houses were replaced while others were left standing. It is also possible that a fragment of a wall, or part of an old building, could have been left standing close to a new house, either from sheer lack of enterprise or for practical reasons, to act as a wind screen for example

The following collections of pots or potsherds, found scattered at various depths, can be assigned to stratum VI.

Pit 18 (fig. 24), on the border between A and B and immediately above Pit 24, was about 15 cms. deep and 120 cms. in diameter; it contained a large amount of charcoal, fragments of large, painted, globular pots (e.g. pl. 26:2, 28), conical food bowls, a fragment of moulded pottery (pl. 69:3) and some sherds of coarse cooking vessels (e.g. pl. 53:1, 3). There was a strong admixture of soot, especially towards the bottom

Pit 16 held two bowls placed one on top of the other. The position of these pots was probably accidental.

Pit 15, on the border of A and B, contained two cooking vessels buried side by side and surrounded by a one centimetre thick layer of burnt clay; the bases of the pots were at -121, they were obviously undisturbed.

Stratum VII. The upper parts of the mound, up to about the third layer, the limits of which were of course arbitrarily chosen, were of a fairly homogeneous structure, consisting mainly of grey or brown clay, with patches of humus-like soil and charcoal and ashes from hearths. Finds from this level, especially in its lower reaches, were comparatively rare.

Remains of houses in this layer were inconspicuous and almost impossible to distinguish from the surrounding clayey soil; their proximity to the surface of the mound naturally resulted in a great deal of disintegration. This level, with the one above it, was only preserved in the western part of the trench. The remains of a brick wall could be seen to the south-west of Pit 13, it was however impossible to trace its extension (fig 17).

Pit 13 (fig. 17) was shallow and contained between 16 and 18 food bowls (several complete) as well as a number of sherds of other vessels; some of the bowls had been placed upside down in the pit. Mixed with the pottery were a number of much decayed animal bones. A certain amount of chaff and charcoal was found in the bottom of the pit. To the east of Pit 13 two burnt bricks stood on end, leaned against each other (pl. 6.3), their highest point reaching a level of -57 (the level of the top of the adjacent wall was -77). The bricks measured 40×24×6 cms.

Wall M probably belongs to an early phase of stratum VII, although it could possibly be assigned to a late stage of stratum VI. The wall had been altered and reshaped and to the north-west passed over an older unidentified stretch of wall. The fragment of a wall (O), which appeared in the north-western corner of the trench, may represent the northern wall of the house J or of the house M; traces of wall M can be seen in the western face of the trench only a metre from wall O. The sun-dried brick was so badly preserved, however, that the possible connection could not be followed up.

In A^{V} 2—3 the remains of a pavement of sun-dried brick tiles was found. The limitations of the tiles and the extension of the pavement are partly uncertain. The pavement is probably related to the wall which was built on top of wall M and must be considered as a repair of it; the bricks are

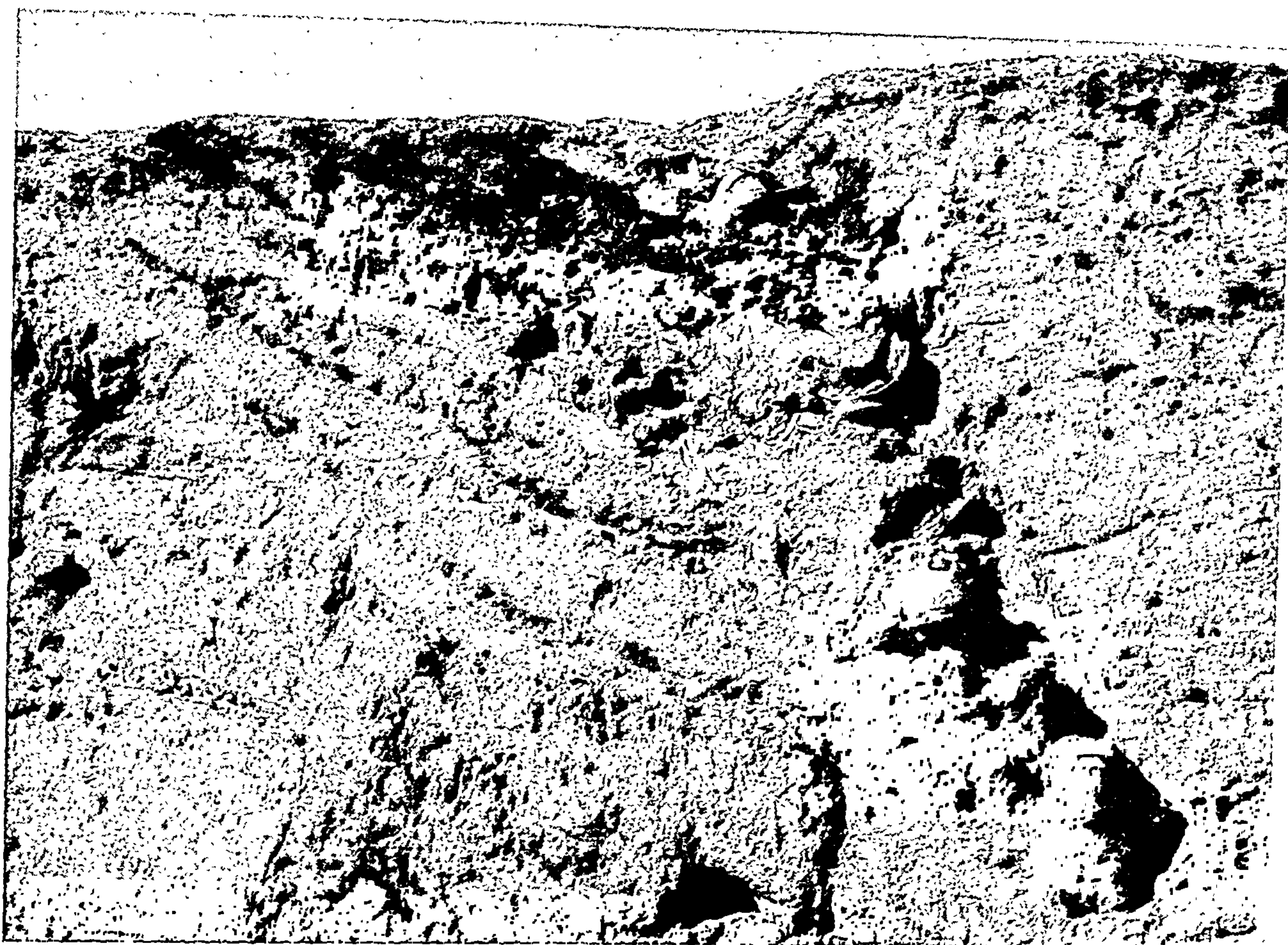


Fig. 25. Trench I. Pit 14.

laid irregularly, some on end and some wedged into position. The corner of a house, which almost reached the surface of the mound, overlay the wall and the pavment.

A number of vessels, both scattered and in groups, can be assigned to stratum VII (fig. 17).

Pit 14, the largest of all the pits found, stretched from the surface down to layer B 8, (fig. 25); it was filled with refuse, mainly large quantities of broken pots. The Mohammedan burial, S 9, was dug into the surface of Pit 14, and was consequently of a later date than the pit. Among the very numerous finds in this pit are globular pots (pl. 20:2, 32:2, 36:2), flask-shaped pots (pl. 43:2—3), spouted jars (pl. 48:1, 12) cooking-vessels (pl. 54:6, fig. 71:17), storage jar (pl. 62:8), beaker (pl. 64:3), flowerpotshaped bowl (pl. 67:13), incense burner (pl. 68:5), terracotta animals (pl. 74:8, 11, 15), fragments of two human faience figures (pl. 82:63, 64) and of one human porcelain figure (pl. 82:62).

Pit 12 contained a large, painted vessel (cf. pl. 19:2), the badly charred base of the pot indicates that it had been used as a cooking vessel. A layer of charcoal and ashes was found below the pot — while it is obvious that the vessel was found in its original position, presumably in a clay lined pit, the details of the structure surrounding it were not altogether clear. Pit 11 contained a complete food bowl placed upside down. Pit 10 was irregular in shape (1.70×1.50 m.) and diffi-

cult to define; it was filled with a large number of broken vessels and a few complete food bowls (e.g. the big vessel on pl. 22, fig 47:2, fig. 49, pl. 30:1). A thin layer of ash, on top and outside, must be of a later date than the pit.

Pit 9 was a large pit (1.70×0.50 m.) the irregular edges of which were cut by the side of the trench. The pit contained a large quantity of potsherds (e.g. pl. 35:4, 37:6), charcoal, chaff, ashes and animal bones. A cooking pot, with a burnt-out bottom, was found at the top of the pit which had certainly been used as a rubbish dump.

A few complete pots and numerous sherds were found in a number of places within a fairly limited area which extended between about x=33—36 and y=3—4 (fig. 17). The vessels, which were placed in an inverted position, were mainly conical food bowls (pits nos 1—8). Inside the bowls or below the sherds were found traces of charcoal, small fragments of animal bones and a white, decayed substance, mixed with rice husks and straw, which disintegrated completely when exposed to the air. In one case the bowls had been placed mouth to mouth.

The area may possibly have been used as a rubbish dump, but the presence of two bowls facing each other and other complete, inverted food bowls may indicate that there is some significance in their position. It is natural in such a case to presume a sacrificial meaning for the deposit on the basis of the frequent occurrence of husks and remains of rice.[1]

Stratum VIII represents the surface of the mound, layer 1, which consisted of clay mixed with sand. It was disturbed over large areas. Within the excavated area twelve Mohammedan burials of a late date were found (p 185 f.)

Between x=35 and 36.5 and between y=1.15 and 2.20, the remains of a wall of sun-dried brick which formed the corner of a house, were found just below the surface (reaching a height of +30 to —15). The size of the bricks, varying between 24×24×6 and 30×24×7 cms., differs from that of bricks found at lower levels, being more square in shape. This wall was in a bad state of preservation, but the building method used in the other walls, placing one row of bricks lengthwise and another at right angles to it, was not employed here. When the bricks were not a perfect square, they were placed lengthwide. The finds did not enable us to date this building.

The surface of the mound was covered with a layer of potsherds. These sherds were originally mixed with a layer of sand on the top of the mound, but when the sand was carried away by wind action, the sherds remained and formed a protective cover which prevented any further erosion of the mound.

[1] Investigations of the plant-remains from Rang Mahal have been undertaken by Mr S S Ghosh, Officer-in-Charge at the Forest Research Institut, Dehra Dun, and will be published in a later paper of the University of Lund's Historical Museum

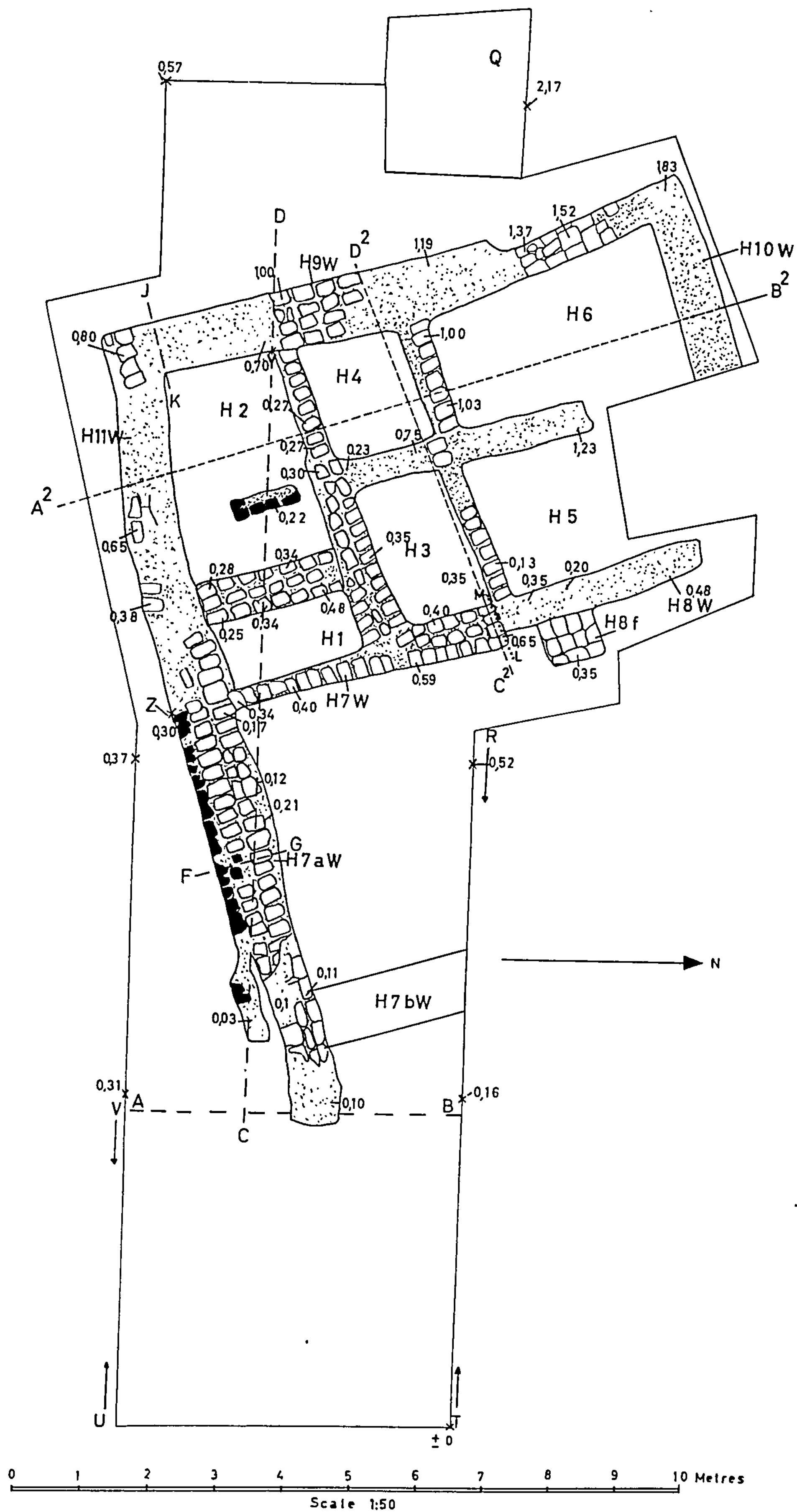


Fig. 26. Trench II, plan (*Ö.H.—H.R.*)

The excavation of the trench [illegible] at the lowest part of the mound between its north-western and north-eastern peaks (cf. [illegible] fig. [illegible]). The mound rises rather soon again to the west (fig. 30, 34). Vertical measurements are taken from a fixed point ±0 at the lowest surface level in the north-eastern corner of the trench (fig. 26).

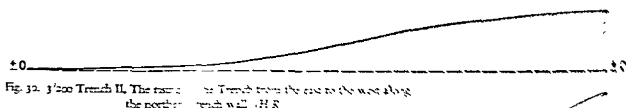


Fig. 32. 1/200 Trench II. The rise [illegible] the Trench from the east to the west along the northern trench wall. (H. S.)



Fig. 31. 1/200 Trench II. The rise of the Trench from the south to the north at the western end of the trench. (H. S.)

The trench, which was orientated east-west, was 22 m. long and 5 m. wide at its eastern end (fig. 26). At a point about 12 m. from the eastern end the trench was extended 2 m. to the south and up to 5 m. to the north, in order to investigate the walls of an extensive house-complex.

The eastern portion of the trench was excavated to a depth of 2 to 2.2 m. below the fixed point, except for a little trial digging to a depth of 5.0 m. and drilling to a depth of about 12 m. (cf. p. 47 and fig. 27—29).

Excavation continued at this depth to a point 4.7 m. from the eastern end where a wall (W 3) was encountered lying in a north-south direction (fig. 26 (Sect. A—B), fig. 33, pl. 0:2). At this point a baulk (1 m. wide), between W 3 and the southern wall of the trench, was retained (plan and photo). Beyond this point excavation continued to the same depth on the space between the northern side of the trench, and the sections H 7 a and H 7. At one point an exception was made: the cross-wall, H 7 b W, was retained with the filling below it (fig. 26). In and around the house-complex, described below, excavation continued to a level sufficiently below the lowest course of bricks to reveal the walls from top to bottom.

The north-western part of the trench, west of the house-complex, was excavated to a level just below the house-wall, H 9. A rectangular area, 2.5 × 1.75 m., along the northern trench wall (Q on the plan, fig. 26) was however excavated to a depth of 1.11 m. below the fixed point ±0, a level which corresponds to layer 15 at the eastern end of the trench. The surface of the mound rises here 2.17 m. above 0; the surface of the opposite wall of the trench however is only 57 cm. above 0 (cf. fig. 30, 31).

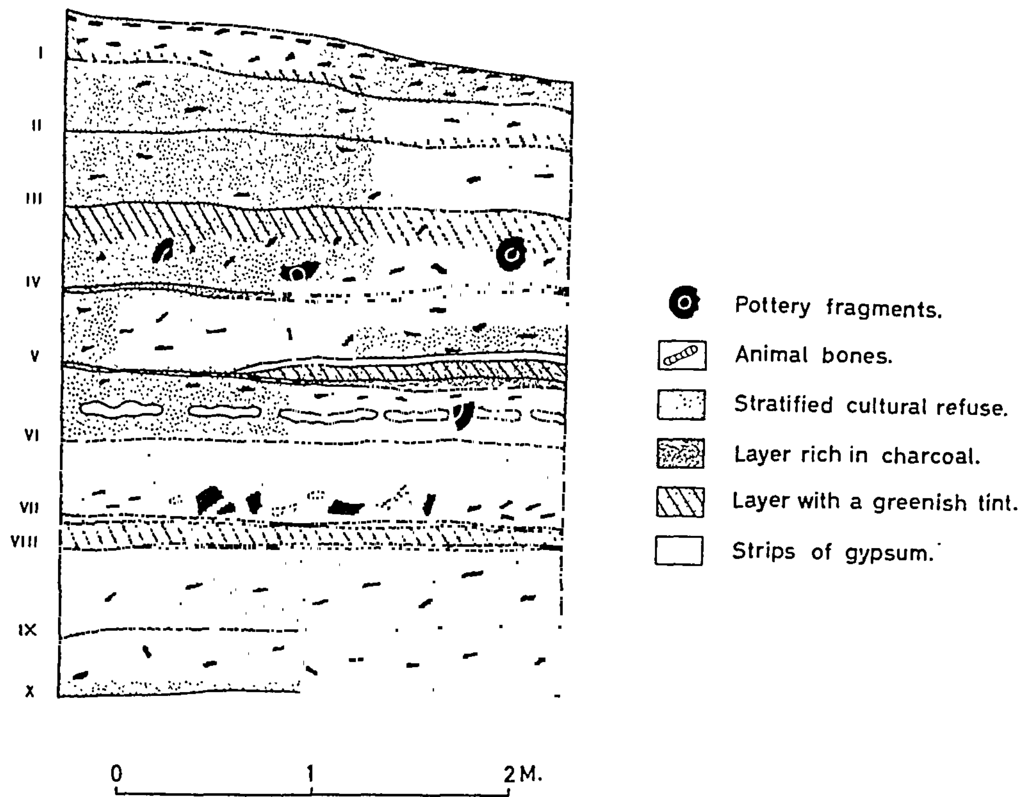


Fig. 32. Trench II, Q, section through layers I—X, in the northern Trench Wall (*G.E.*)

In the open trench the excavation followed the geological layers, numbered 1—16 at the eastern end (fig. 16, 27—29) and I—X in the western area Q (fig. 32); the finds are catalogued accordingly. The layers in and around the house-complex are numbered H, H 1—H 11 (fig. 26, 34). In the rooms H 1—H 6 the division H 1, H 1^2, H 1^3 signifies three layers of similar thickness in a sequence, H 1^3 being the lowest. The letter P indicates the pit described on p. 53, 88: Finds labelled P occur between layers 5 A and 11 C, and those labelled P^2 between layer 15 D and the bottom.

THE SETTLEMENT

Settlement period I—II

As has been shown by Eriksson (pp. 47 f., 50 f.) there are reasonably certain indications of settlement at Rang Mahal in the layers 25—23 and 22.

The fragmentary potsherds in these layers are of a reddish clay of the same character as that general in the higher levels. It is impossible to reconstruct or date the pots from these sherds.

The first traces of buildings were encountered in layer 16. In certain superimposed levels it is possible to see how walls have been damaged and rebuilt and how new walls have been added.

Settlement period III

This period is subdivided into six (numbered III:1—6).

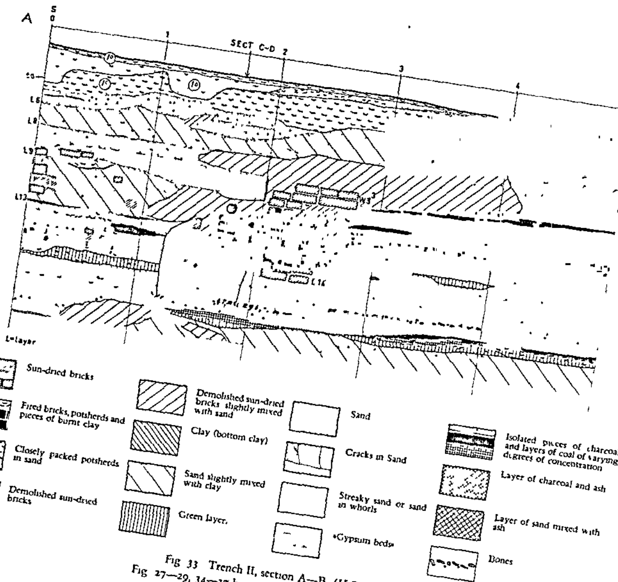


Fig 33 Trench II, section A—B (*H R*)
Fig 27—29, 34—37 have the same symbols as fig 33

Period III.1. To this period belongs the rough wall in the north-eastern corner of the trench described above on page 52 as the delimitation of a cavity or ditch from which clay may have been taken for the manufacture of sun-dried bricks.

Wall H 7 W¹. To this period also belongs the first real house wall. This is the lower part of the northern section of the wall along section H 7 (fig. 35, pl. 9:2), which has its bottom in layer 16, and is here named H 7 W¹ (cf. above on p. 53). The wall is roughly built of large sun-dried bricks, of greatly differing sizes; in certain sizable patches the wall consists merely of large lumps of clay. It is difficult to determine whether these lumps of clay are original features or whether they were added to the wall later, during repair work. Most of the walls encountered in this trench have similar patches of clay between the bricks and, indeed, the same feature can be seen to this day in the houses and boundary walls of the local villages.

H 7 W¹ must originally have had a straight southern end, but this portion is damaged. It did not extend any further southwards than we have shown, as the gypsum layers above and below the layer H 7² reach the wall at this point. The full northward extension of the wall is not known

as the excavation was not continued there below point X on sect. fig. 35. The reason was that we did not wish to cut through the floor, supported by the adjacent layers, outside H 8 (fig. 26: H 8 f). The lower part of the western face of the wall H 7 W^1 could not be studied, except in its lowest courses, as an inner wall, facing room H 3, had been built on to its upper part (Pl. 11 and fig. 38, cf. fig. 26).

Three well-made, fired bricks, found in the deep south-western corner of H 7 a (pl. 12:2, fig. 36), probably belong to this first period of building. It is impossible to say, however, whether they belong to the wall of a house and were found *in situ* or whether their position is accidental. Fragments of the bases of conical food-bowls were found under and around these bricks.

In the extreme eastern part of the trench a few whole fired bricks and many fragments were found, scattered and without order. One of the complete bricks measured 27×20×6.5 cm. Another brick was decorated with a square pattern (cf. pl. 79:10).

Period III:2. Wall W 3^1. To the period III:2 belongs the lower part, W 3^1, of W 3, situated somewhat to the south of the middle of the eastern part of the trench (fig. 33). Only three courses, three bricks deep, remain of this wall, which is situated in layer 14. The bricks are sun-dried. The full extent of this wall is unknown (cf. pl. 9:2).

Period III:3. During this period the greater part of W 3^1 was destroyed, leaving only the lowest courses. As usual many potsherds had been scattered around the house. There is also a layer of charcoal.

Wall W 3^2. A new wall of sun-dried bricks, W 3^2, was then built above the ruins of W 3^1. Five courses of this new wall, which has its base in layer 13, survive. The wall probably extended southwards, but an unmistakable green layer shows that it does not continue northwards.

Potsherds were found at the northern angle of the wall below a bed of charcoal. Many potsherds, mostly fragments of conical food-bowls, were thrown into a break in the wall further to the south, probably when the wall was destroyed.

It is very likely that W 3^2 was connected with the great house-complex to the west; this connection is proved in the topmost layer of W 3 (cf. pl. 9:2).

Walls H 7 a W^1 and H 11 W. The house-complex, described below (p. 86 f.), seems to a large extent to have been built during this period. As the base of the lower part of H 7 a W (here described as H 7 a W^1) (fig. 36, pl. 12:2) is in layer 13, it seems clear that it belongs to this period.

H 7 a W^1 is a fairly solid wall, 4.7 m. long and probably 3 bricks thick, lying in an east-west direction. It was shown during the excavation of the external face of the wall (fig. 37) that the topmost courses, which probably belong to a later period, seemed to rest on a bed of clay and sand only. This bed was in turn partly supported at the base of the wall by a number of unusual square lumps of clay. When we removed a small part of the clay and sand layer we were able to see the courses of sun-dried bricks (pl. 13:2). A section through the wall at this point (fig. 39) shows how both faces, and particularly the southern face, are slanting as a result of missing or misplaced bricks. It seems probable that in the course of time bricks fell out and were replaced by clods of clay, supported at the bottom by the square lumps of clay, described above.

In line with H 7 a W stretches H 11 W to the west; they are not bonded together (fig. 35). The western part of the outermost face of H 11 W was difficult to trace as the shape of the sun-dried bricks was very unclear, this was especially true of the lower part of the wall (pl. 10:1).

as the excavation was not continued there below point X on sect. fig. 35. The reason was that we did not wish to cut through the floor, supported by the adjacent layers, outside H 8 (fig. 26: H 8 f). The lower part of the western face of the wall H 7 W^1 could not be studied, except in its lowest courses, as an inner wall, facing room H 3, had been built on to its upper part (Pl. 11 and fig. 38, cf. fig. 26).

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***Period III:2. Wall** $W\,3^1$*. To the period III:2 belongs the lower part, W 3^1, of W 3, situated somewhat to the south of the middle of the eastern part of the trench (fig. 33). Only three courses, three bricks deep, remain of this wall, which is situated in layer 14. The bricks are sun-dried. The full extent of this wall is unknown (cf. pl. 9:2).

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Wall $W\,3^2$. A new wall of sun-dried bricks, W 3^2, was then built above the ruins of W 3^1. Five courses of this new wall, which has its base in layer 13, survive. The wall probably extended southwards, but an unmistakable green layer shows that it does not continue northwards.

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It is very likely that W 3^2 was connected with the great house-complex to the west; this connection is proved in the topmost layer of W 3 (cf. pl. 9:2).

Walls H 7 a W^1 *and H 11 W.* The house-complex, described below (p. 86 f.), seems to a large extent to have been built during this period. As the base of the lower part of H 7 a W (here described as H 7 a W^1) (fig. 36, pl. 12:2) is in layer 13, it seems clear that it belongs to this period.

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In line with H 7 a W stretches H 11 W to the west; they are not bonded together (fig. 35). The western part of the outermost face of H 11 W was difficult to trace as the shape of the sun-dried bricks was very unclear, this was especially true of the lower part of the wall (pl. 10:1).

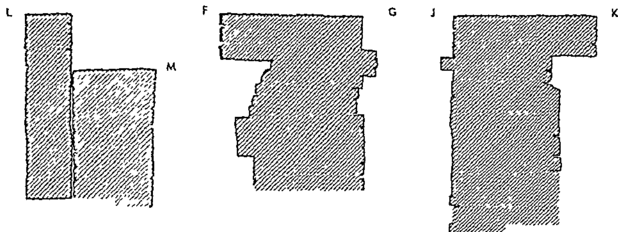


Fig 38. Trench II, section L M. (*H R*) Fig 39 Trench II, section F—G (*H R.*) Fig 40 Trench II, section J—G (*H R*)

Wall H 7 W². H 7 W² is related to H 7 a W¹ with which it makes a right angle corner (fig. 26, pl. 9:2), but it is difficult to follow its full extension northwards as it quickly fell into disrepair and only slight traces are to be found in the southern corner. It is possible that there was a doorway to the north of these traces, as vertical dry-cracks and pottery were found together in the underlying layers. There are clear indications of new building in the northern part of H 7 W during this period. The thick green layer H 7¹ was then formed between the southern and northern remains of the former wall or walls (cf. fig 33).

Period III:4, *Wall H 7 W³*. In period III:4 the northern part of H 7 W was repaired or rebuilt forming H 7 W³ (fig. 35). Six brick courses of this wall, which was extended 1 m. southwards, now survive.

At the southermost part of H 7 W, towards H 7 a W, are two courses of bricks from a wall of this period. But the green layers indicate that there was no connection between the northern and southern parts of H 7 W³.

"Floor" H 8 f. At the same time the "floor" H 8 f, outside the eastern wall of room 5, was laid down on layer 11 B. The "floor" (cf fig. 26·H 8 f and pl. 11) forms a rectangle, measuring 3×4 m, of large sun-dried bricks. It is possible that the floor formed part of an eastern section, or at least an eastern room, of the house-complex; or it might, perhaps, be the floor of a small storehouse.

Wall H 7 b W. H 7 b W, of which only two or three courses of bricks remain, obviously belongs to this period. The wall, which runs in a northerly direction, makes an obtuse angle with H 7 a W and rests on layer *11* C¹ (fig. 26, fig. 27).

Period III:5. *W 1*, appearing in the eastern profile of the trench, is the only wall belonging to period III:5. It has its base on layer 10 and is described on p. 57 (fig. 27).

Period III:6, *Wall W 3³*. During period III:6 the wall W 3³ (fig. 33), of which only two incomplete courses of bricks remain, was built on the remains of W 3². This is the last known period of this wall which, in the sixth period also ran in a southerly direction on the remains of the southern part of W 3². The base of W ³ is in layer 9

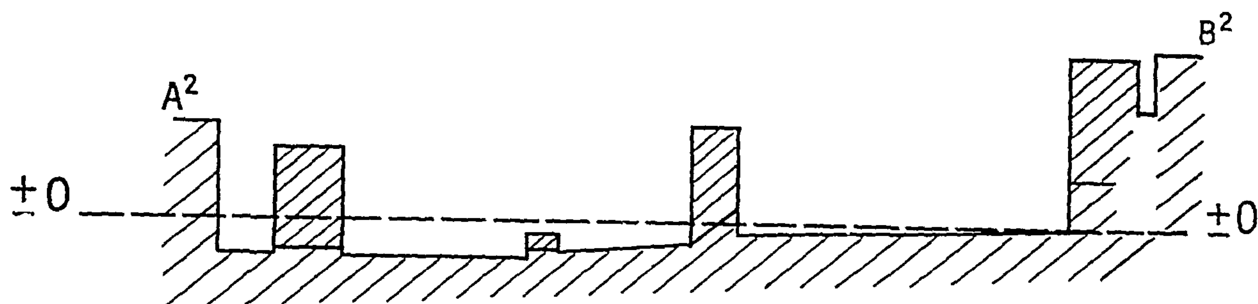


Fig. 41. ca 1/80 Trench II, section A²—B². (*H.R.*)

Wall H 7 a W². Wall H 7 a W² (pl. 9:2, fig. 26), the eastern end of which forms a right-angle with wall W 3³, runs in a westerly direction on the remains of H 7 a W¹. The courses of fired bricks found to the south of the wall (i.e. outside the wall) are probably related to it (fig. 37).

These fired bricks vary in size (e.g. 30×23×6.5 cm., 22×17×6.5 cm., and 22×16×7.5 cm.). Two fired bricks decorated with acanthus leaf ornament were found in the loose earth filling above the wall (pl. 79:1 and 2); but it is impossible to say whether they belong to it.

The faces of H 7 a W are warped at its eastern end, owing to cracks in its upper courses (cf. fig. 26 and pl. 9:2).

Wall H 7 W⁴. The wall H 7 W⁴ forms an angle with H 7 a W². It rests on the southern section of H 7 W³ and its base lies on layer 5 A. The upper part of H 7 W³ to the north may have been levelled off and used as a foundation for the new wall.

As can be seen on pl. 10:2 and pl. 11 the low inner addition to the eastern wall of room H 3 is built on the same layer as H 7 W⁴ and is, consequently, contemporary with it. It is not so high as H 7 W⁴ but was probably meant to support it. The southern portion of the wall has no such support, being only one brick thick. The inner side of this wall constitutes the eastern wall of room 1 (fig. 26).

Wall W 2. Wall W 2, which can only be seen in the northern section of the trench (fig. 27), belongs to period III:6. The wall is 1 m. wide and its present height is 60 cm.; one incomplete and nine complete courses survive. Its northward extension is unknown but the bricks can be traced for a few decimetres in a southerly direction. There is certainly a connection between W 2 and H 7 a W; a bank of earth between the walls was no doubt formed by collapsed sun-dried bricks.

The house-complex. The plan (fig. 26) reveals a somewhat irregular rectangular construction, orientated north-south, and enclosed to the south by the H 11 W, to the west by the H 9 W, to the north-west by H 10 W and to the east by H 7 W; we were unable to trace a wall in the north-east.

Outside this almost entirely enclosed area there are, as we have shown above, other constructions: most prominent is H 7 a W, an eastern continuation of H 11 W. As can be seen from fig. 37 there is a break between H 7 a W and H 11 W, at point Z, where the fired brick courses finish in the west and where the house proper starts. There is no reason why H 7 a W should not form part of a house or indeed of the house-complex itself, but this cannot be proved. Among other constructions are H 7 b W and W 3. It is not clear how far the latter stretched

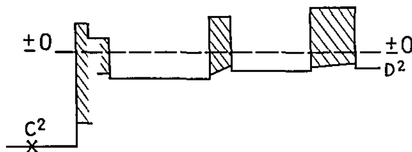


Fig 42. ca 1/80 Trench II, section C^2—D^2 (*H R*)

towards the south, but where it can best be traced it seems to be related to H 7 a W. H 7 b W forms a slightly obtuse angle with H 7 a W, but it is not impossible that it could have belonged to the same complex.

The house-complex continues to the north or north-west. There was a large pile of mud-bricks against the H 10 W and to the north-west of the angle between H 9 W and H 10 W, but no sense or order could be made from it. About 10 m. from the western wall H 9 W, where the surface rises steeply, the remains of a wall can be seen as well as a floor on a level considerably higher than the floor level of the house-complex.

In the area of the house we find a number of walls that are definitely contemporaneous. The southern part of H 11 W and the southern end of the western wall, H 9 W (pl. 10:1), are bonded together. On the H 9 W is a break at point Y (fig. 26) on the inner face of the wall (pl. 9.1).

The eastern wall of room H 5 (H 8 W) must have been a continuation of the inner face of the eastern wall of H 3, which latter was built as a support for the inner face of the northern part of H 7 W (pl. 10:1,2). The external face of H 8 W does not form a straight line with the external face of H 7 W (pl. 11, fig. 26).

The wall between room H 3 and H 4 continues between rooms H 6 and H 5 and was built at the same time as the wall between the rooms H 3 and H 1 and the eastern part of H 2. The eastern inner wall of H 3, described above, seems to be bonded in with this latter wall The wall between rooms H 4 and H 6, on the other hand, is not bonded into the walls with which it makes an angle. The same is true of the wall between H 1 and H 2 (pl. 9:1, 10:2). This wall is probably later than the surrounding walls· if this is not so room H 1 has always been extremely small (not much more than 2×1 m.). It is possible that the walls between rooms H 3 and H 5 (cf. pl. 10:2) and between H 4 and H 2 (fig. 9:1) are not real walls, as rooms H 3 and H 4 are also very small. Whatever the case the partition between H 3 and H 5 was added later than the western wall of H 3 and H 5, as it covers some red paint on that wall (compare below). The partition consists of only 2 courses of bricks. This may have been a kind of threshold. It is noteworthy that there are no obvious doorways in the house-complex.

There are no complete or quite definite floors (see however p. 85 above). It is uncertain whether the four fired bricks in a horizontal row in the centre of room H 2 (fig. 26, pl. 10:1) form the remains of a floor. A square of dried bricks was also found in the bottom level of the south-western corner of room H 5.

An interesting feature of the western walls of rooms H 6 and H 5 is that they had been rough-cast in an off-white colour. A broad band 10 to 15 cm. in width was painted on this base in red ochre[1], forming a frame along the wall (pl. 14:1 and 2). We tried to preserve the paint by spraying it, but the colour quickly faded and disappeared.

To sum up: the house-complex, except for the northern end of the eastern wall, has been built in two main periods. During these later periods the lower part of this earlier wall must have been covered with sand to the level of the bottom of the later walls.

From a stratigraphical point of view the oldest part of the house-complex as we know it now (e.g. the lower part of the north-eastern wall, fig. 35) is earlier than layer c below B 14 in trench I. The whole house-complex, built on layer 13 in trench II seems to correspond to the brick-layer c.

As can be seen from section C—D, fig. 34 the top of H 7 W, at the time of excavation, was just below the surface of the mound. Fig. 41 and Fig. 42 show two sections A^2—B^2 and C^2—D^2 (cf. the plan, fig. 26).

The Pit. In our discussion of the excavation of trench II, we must mention the pit, situated about 1 m. east of H 7 W along the northern edge of the trench (fig. 27 and pl. 15). It is about 2 m. across and reaches down to layer 17. In and below layer 5 A it was filled with fragments of various types of vessel; especially frequent, however, were fragments of the common conical bowls. The pit was unstratified and material from different periods is mixed together. The pit was either used at a very late stage of the settlement or was dug, after the settlement had been abandoned, by people interested, for one reason or another, in the mound. The latter being the case the excavators must have filled the pit with the excavated material. The pit is indicated by the letter P.

[1] Iron oxid hydrate: analysed by G. Nydahl, Institute of Chemistry, University of Uppsala.

FINDS[1]

THE POTTERY

Type 1 *Globular Jars*

Vessels of this type are characterised by a spherical body and pronounced rim They sometimes are pear-shaped and rarely (e g fig 43·5,7) have a flattened bottom The type can be subdivided thus.

Type 1A Pl. 16(fig 43 1,2,6,5), fig 43 3, 4, 7, fig. 44

Type 1A is a plain vessel of common form with a pronounced straight, or incurved, neck and a simple thickened rim, sometimes out-turned (pl 16, fig. 43, 44). Usually there is no decoration save for plain or wavy applied bands of sandy texture, starting below the neck (pl. 16 2—4, fig. 43·2, 3, 5—7).

The main type occurs abundantly in all levels. The variant rim-forms are of no chronological significance as they also appear throughout the excavated layers

Type 1B is of more elegant form, having a short inconspicuous neck and a broad, thick rim which is sometimes everted, the rim usually has an internal groove The surface has generally a pinkish or reddish slip and there is often, but not always, a painted design carried out in black — the design is sometimes incised (cf. below)

There are at least four main variants of this type of rim (fig. 45).

Variant a *(fig 45·a) occurs most frequently at all levels This is a medium-sized vessel with a short, rather* upright neck, a narrow mouth and a horizontally everted rim of square section The body turns quickly outwards from the neck giving the vessel a squat appearance The base is round and there are no marks of ribbing. The vessel illustrated pl 17 1 and fig 46 1 is 28 cms high, 32 cms in maximum diameter, with a diameter of 15 cms at the mouth Fig 46 16 illustrates a remarkably heavy neck. Occasionally vessels of a larger size are encountered as that illustrated on pl 18 5, which has a diameter at the mouth of 26 5 cms Other examples of type 1Ba are illustrated in pls 17 2, 18 1—4, 6, 7 and fig. 46.2. Variants of this sub-type are illustrated in fig 46·3—25. Certain specimens with an external neck ridge (fig 46·4, 5, 7, 8, 22—25) approach Type 1Bb, variant 1

Variants b—d These variants have a general mutual resemblance, but the pronounced angle of the shoulder is not so noticeable as in variant a The base is rounded, although occasionally it is elongated and pear-shaped (fig. 47·2 and pl. 23) Fig 47·2 (cf pl. 22) illustrates the largest vessel of Type 1 which has a height of 56 cms, is 50 cms. in diameter and 31 cms in diameter at the mouth

Variant b has a short incurved neck with external ridge, a broad flaring rim and an internal groove (cf. fig 45·b), pl 19·1 (fig. 47 1), pl 20,2 (fig 48), fig. 50:1—6. This type is known from all levels down to I.B 11 and II·15.

Variant b 1 (fig 49, fig 50 7—13) has a very broad out-turned rim, which is still more exaggerated in variant 2 (fig 50·14—16, 19—20) where the neck is much shorter. In fig 50.18—20 the external neck ridge is flattened and disappears altogether in variant 3 (fig 50.17—21). The vessels shown in fig 50 14, 16—18 were found in the lowest layers, where the type most commonly occurs. The fragment illustrated in fig 50·15 comes from a higher level, trench I:B 2

Fig. 50·22 illustrates a transition between variant 1 (cf. fig. 50·11) and variant 4 (fig. 50:23—33) in which the internal neck groove has disappeared and the rim, which is turned upwards instead of outwards, is straight and has an external ridge

[1] Trenches and layers of the finds are mentioned in the subtitles of figures and plates S means Surface

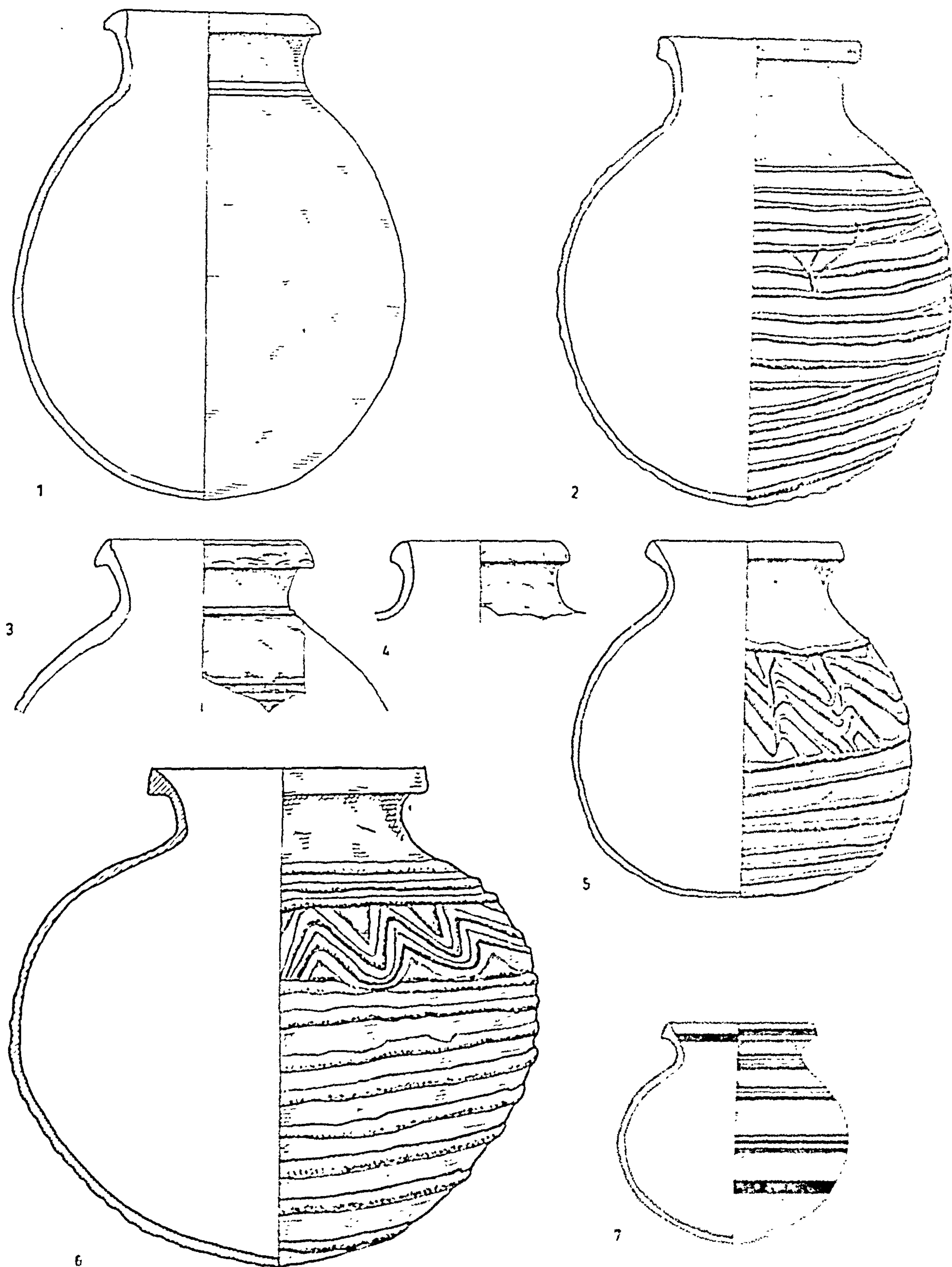


Fig. 43. 1/4. Globular pots Type IA

1) (pl. 16:1) I:B10, 2) (pl. 16:2) I:A^{x}5, 3) II:10, 4) IA^{x}4, 5) (pl. 16:4) I:A^{x} Pit 20, 6) (pl. 16:3) A^{x} Pit 2 [illegible] I:A^{x}, Pit 20; 7) II:H5^{2}.

Fig 44 1/4 Globular pots Type 1A

1) II V, 2) I B10, 3) I A6, 4) I B6, 5) I A7, 6) B9, 7) I B8, 8) I B4, 9) I B9, 10) II P², 11) I B10, 12) I B8, 13) II 11C, 14) I A5, 15) I A14, 16) I A13, 17) I B8, 18) I B9, 19) I A13, 20) I B9, 21) I B8, 22) I B14, 23) I B8, 24) II P², 25) I B Pit 27, 26) I A9, 27) I A4, 28) I B13, 29) II 16, 30) I A14, 31) II IX, 32) I A3, 33) II P

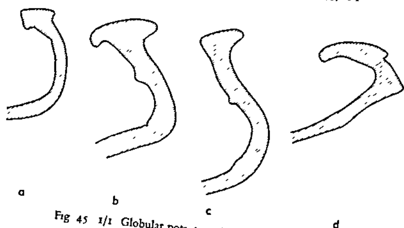
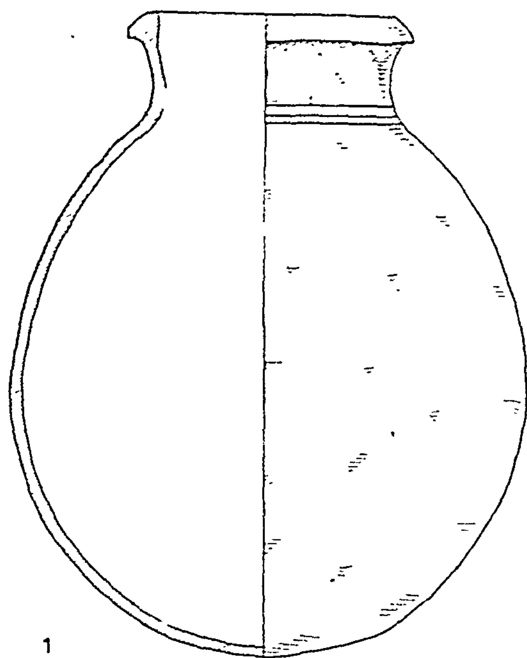
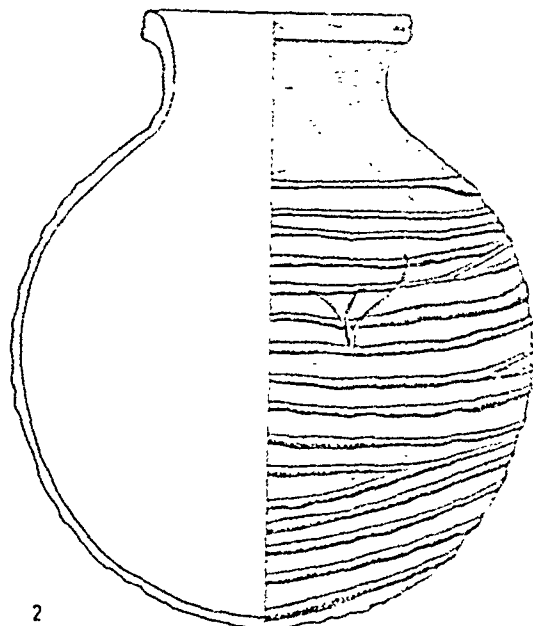
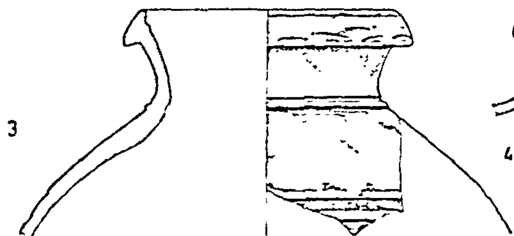


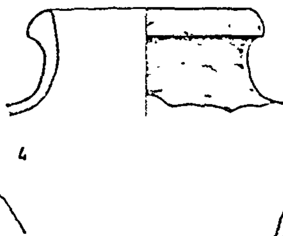
Fig 45 1/1 Globular pots, type 1B, variants a, b, c, d

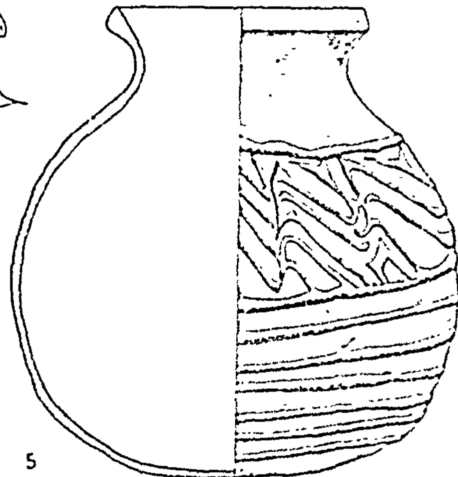
It seems obvious that simplified rims (e g fig 50·34—41), variant 5, are related to variant 4
The available evidence suggests that the two groups var. b 4 and 5 often have applied horizontal ribbings
Vessels of both these groups are found at all levels
Variant c (cf fig. 45 c) has a recurved neck with external ridge and internally hollowed rim, pl. 23, pl 24 (fig 51·1), fig. 52, pl 25. Very often this rim is heavy and has rounded edges, fig 51 4—9, 11, we have distinguished this type as 1 Bc variant 1. A smaller group, variant 2, has a more prominently out-turned rim and

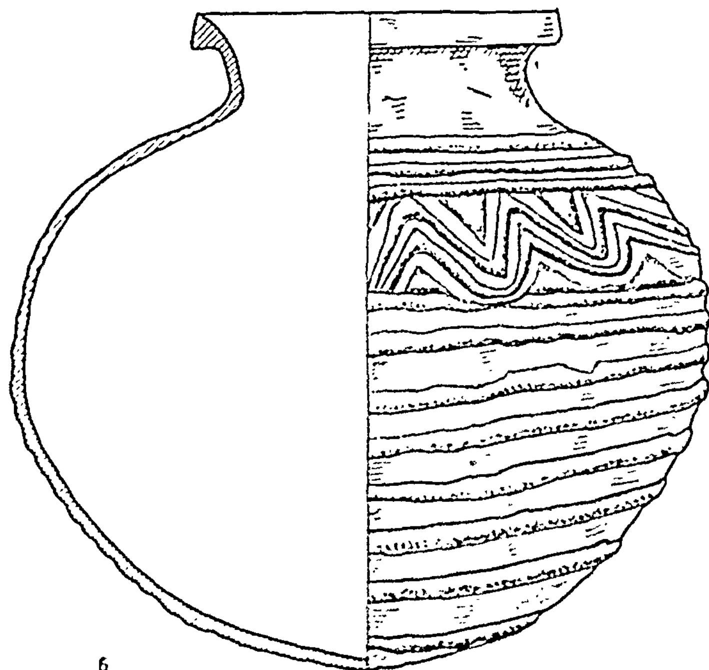












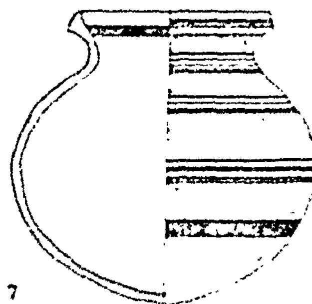


Fig. 43. 1/4. Globular pots. Type 1A.

1) (pl. 16:1) I:B10; 2) (pl. 16:2) I:A^{x}5; 3) II:10; 4) IA^{x}4; 5) (pl. 16:4) I:A^{x} Pit 20; 5) (pl. 16:4) A^{x} Pit 2[illegible]; 6) (pl. 16:3) I:A^{y}, Pit 20; 7) II:H5^{3}.

Fig 44 1/4 Globular pots Type 1A

1) II V, 2) I B10, 3) I A6, 4) I B6, 5) I A7, 6) B9, 7) I B8, 8) I B4, 9) I B9, 10) II P², 11) I B10, 12) I B8, 13) II 11C, 14) I·A5, 15) I A14, 16) I A13, 17) I B8, 18) I B9, 19) I A13, 20) I B9, 21) I B8, 22) I B14, 23) I B8, 24) II P², 25) I B Pit 27, 26) I A9, 27) I A4, 28) I B13, 29) II 16, 30) I A14, 31) II IX, 32) I A3, 33) II P

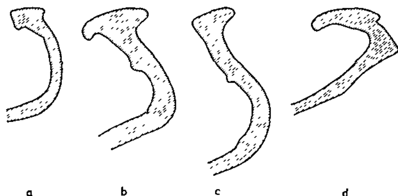


Fig 45 1/1 Globular pots, type 1B, variants a, b, c, d

It seems obvious that simplified rims (e g. fig. 50·34—41), variant 5, are related to variant 4

The available evidence suggests that the two groups var b 4 and 5 often have applied horizontal ribbings. Vessels of both these groups are found at all levels.

Variant c (cf. fig 45.c) has a recurved neck with external ridge and internally hollowed rim, pl. 23, pl 24 (fig 51·1), fig. 52, pl 25 Very often this rim is heavy and has rounded edges, fig. 51:4—9, 11, we have distinguished this type as 1 Bc variant 1 A smaller group, variant 2, has a more prominently out-turned rim and

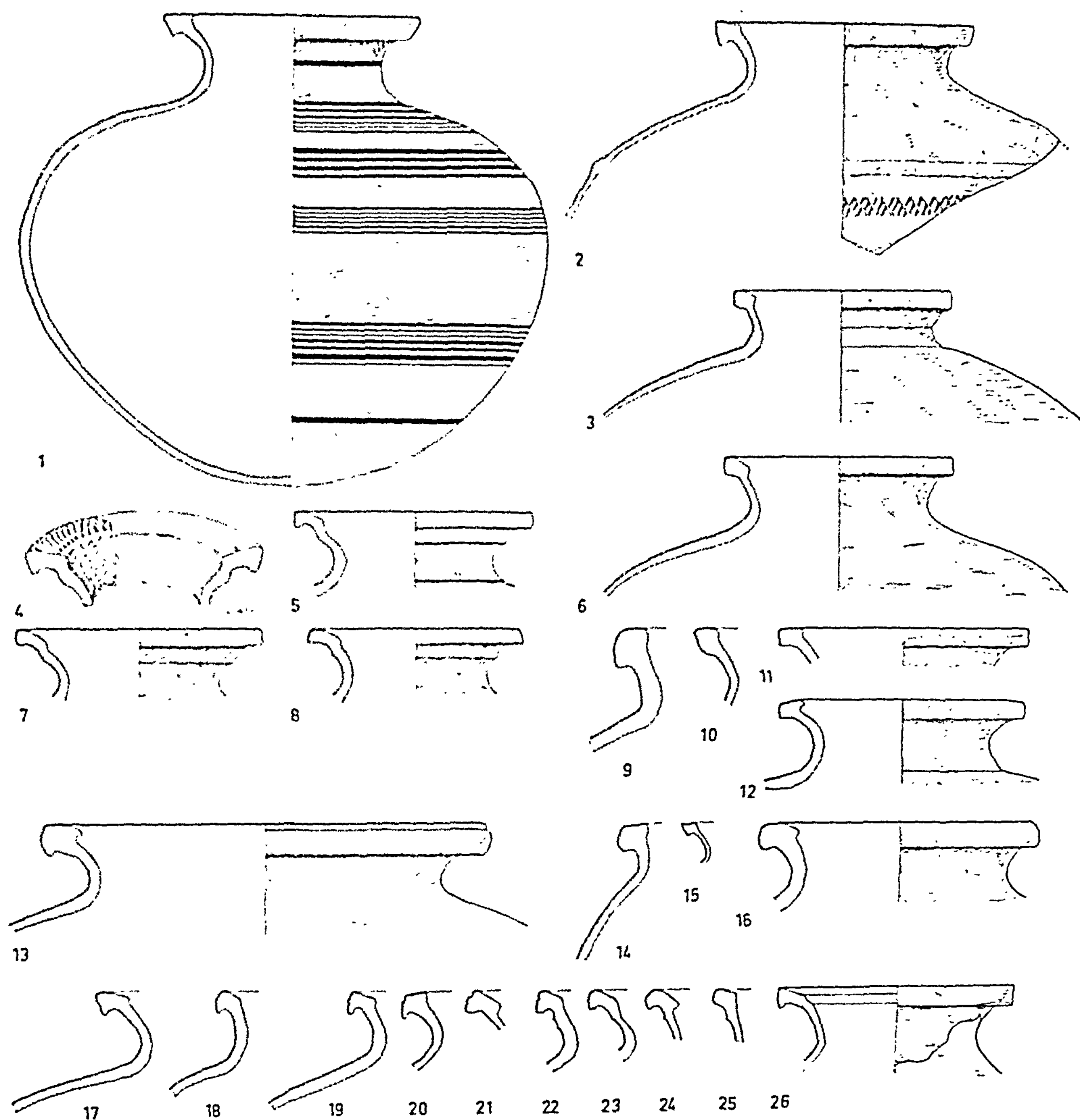


Fig. 46. 1/4. Globular pots. Type 1Ba.

1) (pl. 17:1) A^{v} Pit 20; 2) II:1; 3) I:B10; 4) I:B6; 5) I:B13; 6) I:B10; 7) I:B13; 8) I:A13; 9) I:B8; 10) II:1; 11—12) II H7[1] 13) I:A^{v}1; 14) I:B8; 15) I:B5; 16) I:B8; 17) I:B5; 18) I:B8; 19) I:B9; 20) I:B Pit 17; 21) II:H7 a[5]; 22) I:A3; 23) I:A11; 24) II:IX; 25) II:11C[1]; 26) I:B Pit 25.

external neck ridge, pl. 26:3,4 (fig. 51:3), fig. 51:2, pl. 25:2—3. The form illustrated in pl. 26:1 (fig. 51:12) and pl. 26:2, which is incurved between the external ridge and the lip, is transitional with variant b.

The rim of another small vessel, similar to that illustrated in fig. 52, overhangs slightly and this type is known as 1Bc variant 3, pl. 25:1 (fig. 53:1), 53:4,6. Variations of this type are seen in fig. 53:7—9,18,19 (known as 1Bc variant 4) and fig. 53:10—15,20—22 (1Bc variant 5).

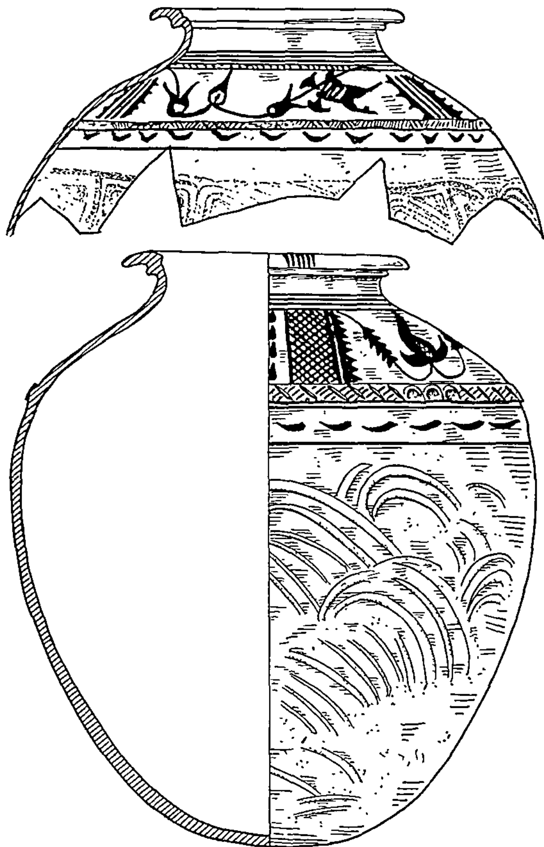


Fig. 47 1/4. Globular and pearshaped pots. Type 1Bb
1) (pl 19 1) I:A^{v} Pit 20, 2) (pl 20· Big vessel) I·A Pit 10

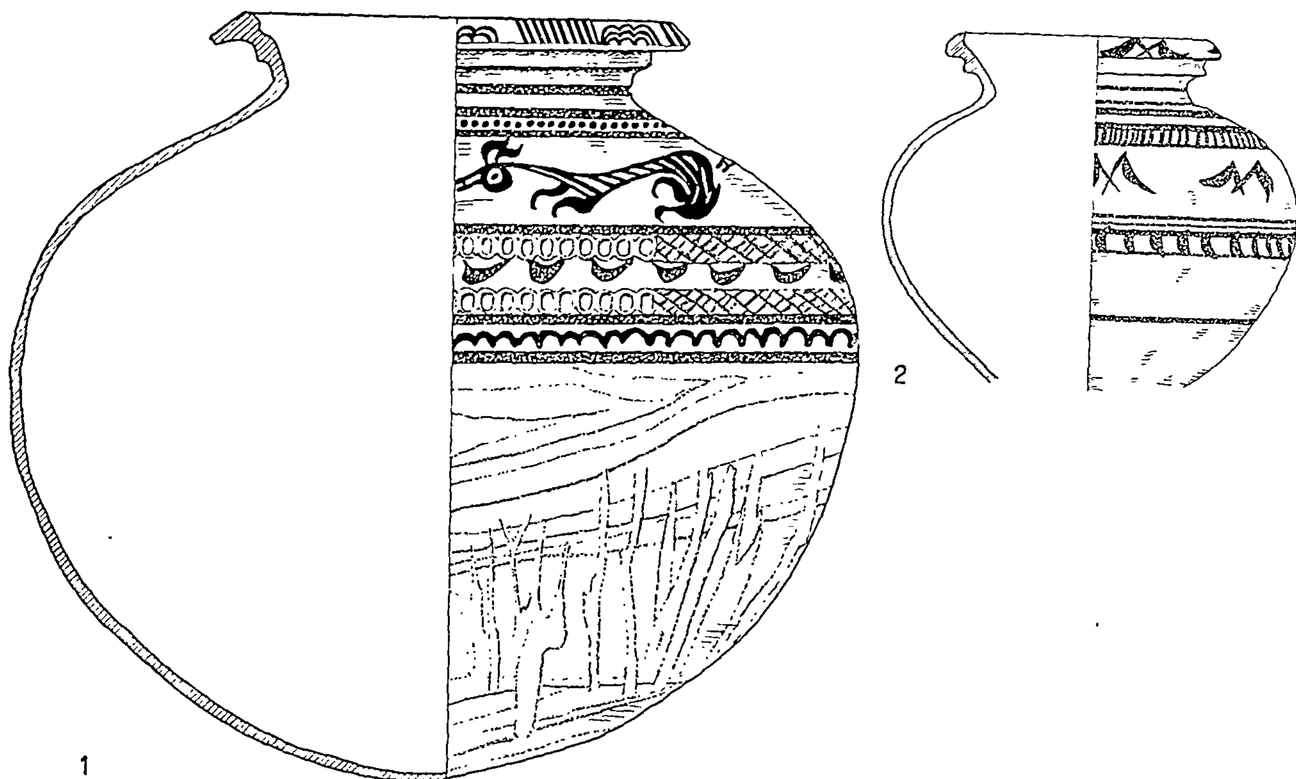


Fig. 48. 1/4. Globular pots. Type 1Bb.
1) (pl. 21:1 and pl. 22) A^v Pit 20; 2) (pl. 20:1 and pl. 22) A^v Pit 20.

Both painted and unpainted pottery occurs in type 1Bc. The incised patterns on certain rims (variant 6, fig. 54), which are closely connected with variants 3—5, are of great interest. One rim is painted on top of the lip, fig. 54:3.

The large vessels of type 1Bc variant 1 appear throughout the excavation at all levels; the more elegant smaller types were mostly found in the middle and upper layers, as were the variants 3—5. The vessel represented by the sherd illustrated in fig. 53:13 came from I:B Pit 25 and that illustrated in fig. 53:16 from II:14. No vessel belonging to variant 6 was found in a level lower than I:A 7 (fig. 54:4). The sherd illustrated in fig. 54:5 came from I:B 5, the others were found in the higher levels.

Variant d (cf. fig. 45:d) is represented by the large painted vessels like the nearly complete jar illustrated in pl. 27:1 (fig. 55:1), and by those illustrated in pl. 27:2, pl. 28, pl. 29 and by smaller vessels e.g. pl. 31:1 (fig. 56:1). The shoulder turns quickly into the rim which forms a wide flange and has an internal groove. The rim is generally convex but is occasionally flat, pl. 30 (fig. 55:2). This type is closely related to 1Bb variant 2, fig. 50:14, 16, which has a short neck, flattened ridge and out-turned rim. If the example illustrated fig. 56:4 can be taken as a variant of type 1Bd variant 1 the affinity to 1Bb, fig. 50:20, is also very striking. In small vessels (variant 2), as those represented by fig. 56:3, 5—9, 11—14, the flange of the rim extends both inside and outside the vessel. The vessel represented in fig. 56:6 could belong to either of the two variants b and d, as can be seen in fig. 50:17 and 21 and in fig. 56:5. The typology is further complicated by the likeness between these vessels and that illustrated in fig. 46:7, which is a variant of 1Ba. Variant 3 has an exaggerated rim, fig. 56:4.

In variant 4 the rim is exaggeratedly splayed out, fig. 56:10. Type 1Bd is well represented in trench $I{:}A^v$ Pit 20 and it is not usually found in the lowest layers, although one rim came from II:x. The small vessels of variant 2 are found at all levels, although they are more frequent in the higher levels.

It has been demonstrated, that there is often a close correspondence between specimens which are classified under different variants, as is natural in such a craft as pottery. Here we can only add certain specimens which do not

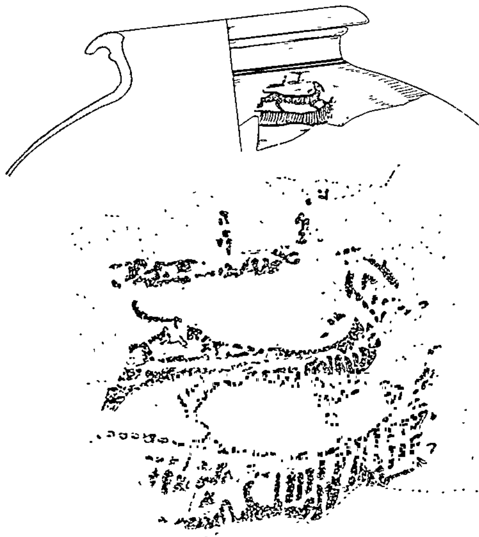


Fig 49 1/4, Detail 1/1 Globular pot Type 1Bb variant 1 I A Pit 10

fit into the framework described above Although there is a certain similarity between the painted rim of fig 58 and certain other types, e g 1Ba, fig 46 4, and 1Bd, fig 55 2, it is unique in shape.

The vessels represented in fig 59 have a common feature in the groove on the rim — an unexceptional feature. The general appearance of fig 59 1,3,4 is much the same as type 1A, fig 43, 44 The several grooves on the shoulder of the pot illustrated in fig 59 3, is rare Fig 59 2 resembles fig 53 21 but does not quite give an impression of affinity with fig 53 1 and through this example with type 1Bc. Another heavy rim with internal and external flange, without a groove, is represented in fig 60 The affinity of this to Type 1A is immediately evident, although the rim is suggestive of a simplification of broader types of rim, e g fig 49

The rim of the small vessel, fig 61 4, is of the same character as represented by Type 1A, but the appearance of the pot, its shape and painting, refer it more closely to Type 1B The only similar vessel came from trench I A Pit 21, although in this case the rim had a greater flare and was less heavy

We might also mention here the vessels illustrated in fig 61 1—3 which have a short, fairly straight neck and a flat, horizontal rim with a groove at the top These rims closely resemble those of the spouted vessels represented in pl. 44:3 and 6. Fig. 61·1 shows a fragment of a vessel, enough of which remains to demonstrate that it had no spout. The painted parallel lines give it a similarity to fig 61 3 and fig 46 1

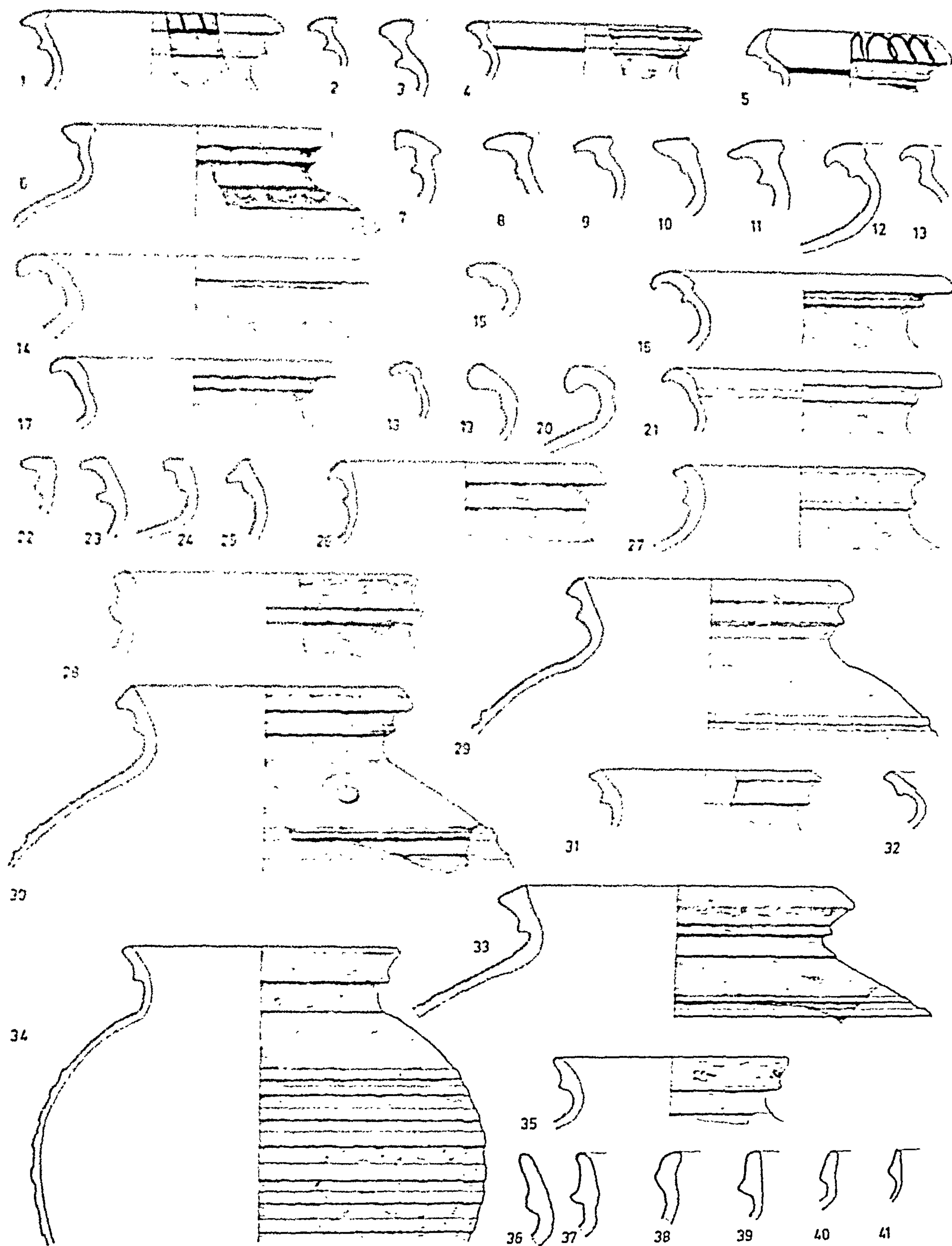


Fig. 50. 1/4. Globular pots. Type 1Bc.

1) II:2A; 2) II:13; 3) I:A Pit 9; 4) II:5A; 5) II:4²; 6) II:15; 7) II:H6³; 8) I:A6; 9) II:P²; 10) I:B11; 11) II:12; 12) I:B11; 13) II:10; 14) I:B Pit 25; 15) I:B2; 16) I:A11; 17) I:B14; 18) I:B14; 19) II:13; 20) I:B4; 21) I:B13; 22) II:H6²; 23) I:A1; 24) I:B9; 25) II:P²; 26) II:H7a³; 27) I:B8; 28) I:A9; 29) I:B Pit 15; 30) I:B8; 31) I:A9; 32) I:B8; 33) S; 34) II:15; 35) I:Av 6; 36) I:B14; 37) I:A14; 38) I:A5; 39) I:B10; 40) II:8; 41) I:A Pit 3.

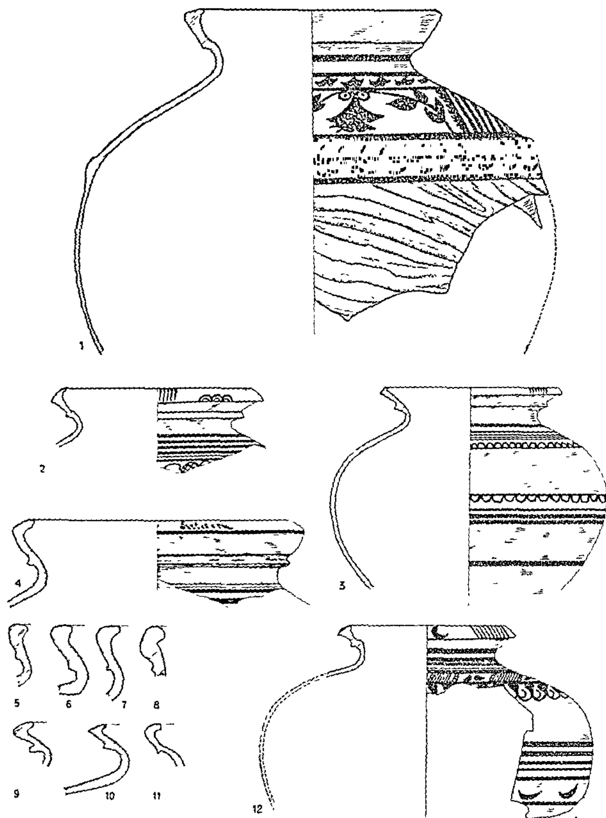


Fig. 51. 1/4 Globular pots Type 1Bc.

1) (pl 24) I Av Pit 20, 2) (pl 25 2) I B8, 3) (pl 26 4) I.Av Pit 20; 4) II 12; 5) II 15, 6) I·A12, 7) II 2[1], 8) II 15; 9) II x, 10) I B2, 11) I B8, 12) (pl 26·1) II:P



Fig. 52. 1/4. Globular pot. Type 1Bc. I:A^v Pit 20.

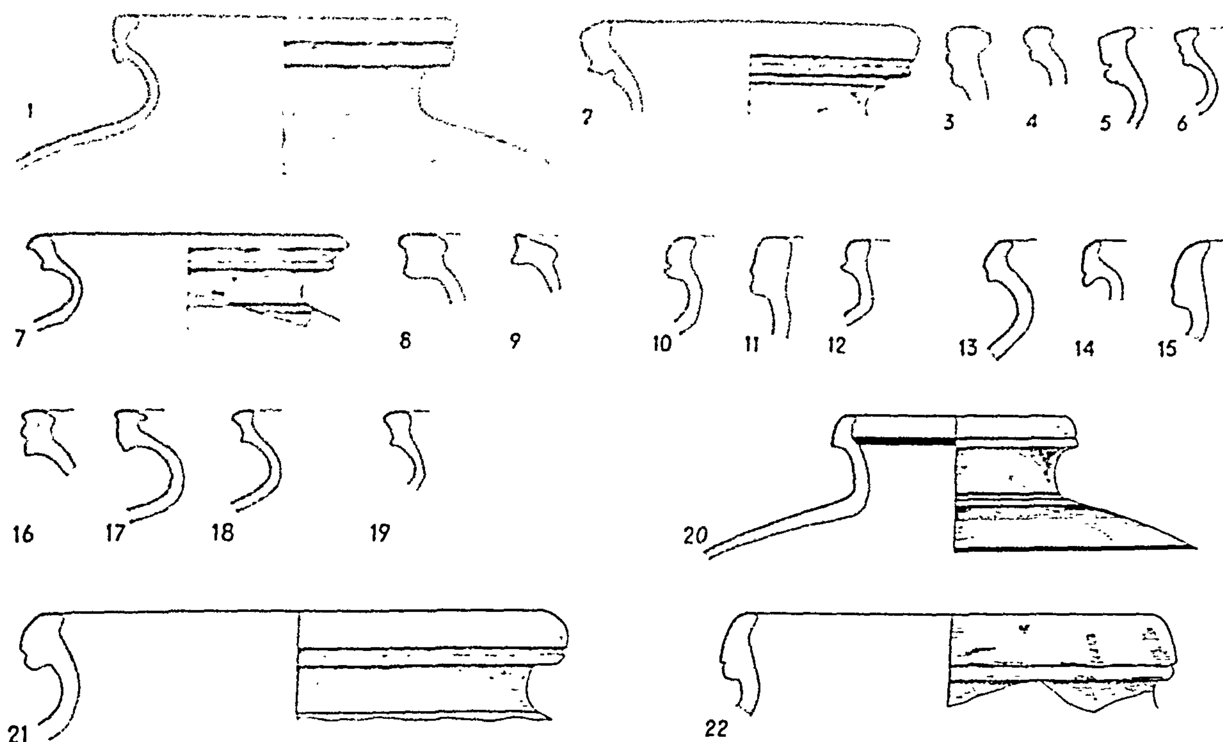


Fig. 53. 1/4. Globular pots. Type 1Bc, variants cf. p. 92.

1) (pl. 25:1) I:A6; 2) II:4^2; 3) II:13; 4) II:1; 5) I:B Pit 14; 6) II:H6^3; 7) II:12; 8) II:H5^2; 9) II:13; 10) I:A3; 11) I:B7; 12) II:H6^2; 13) I:B Pit 25; 14) I:A1; 15) I:B7; 16) II:14; 17) I:B Pit 14; 18) II:12; 19) II:H9^3; 20) I:B7; 21) I:A^{v}4; 22) I:B7.

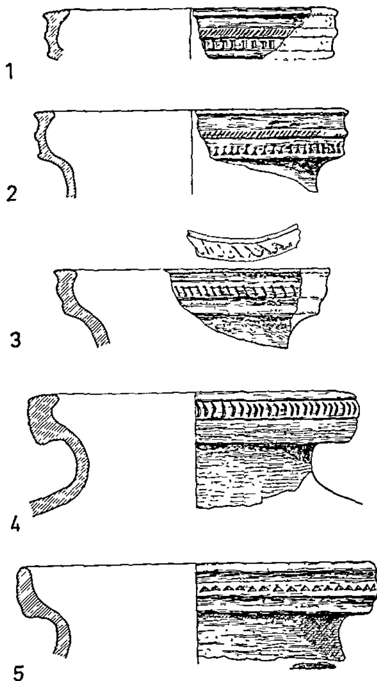
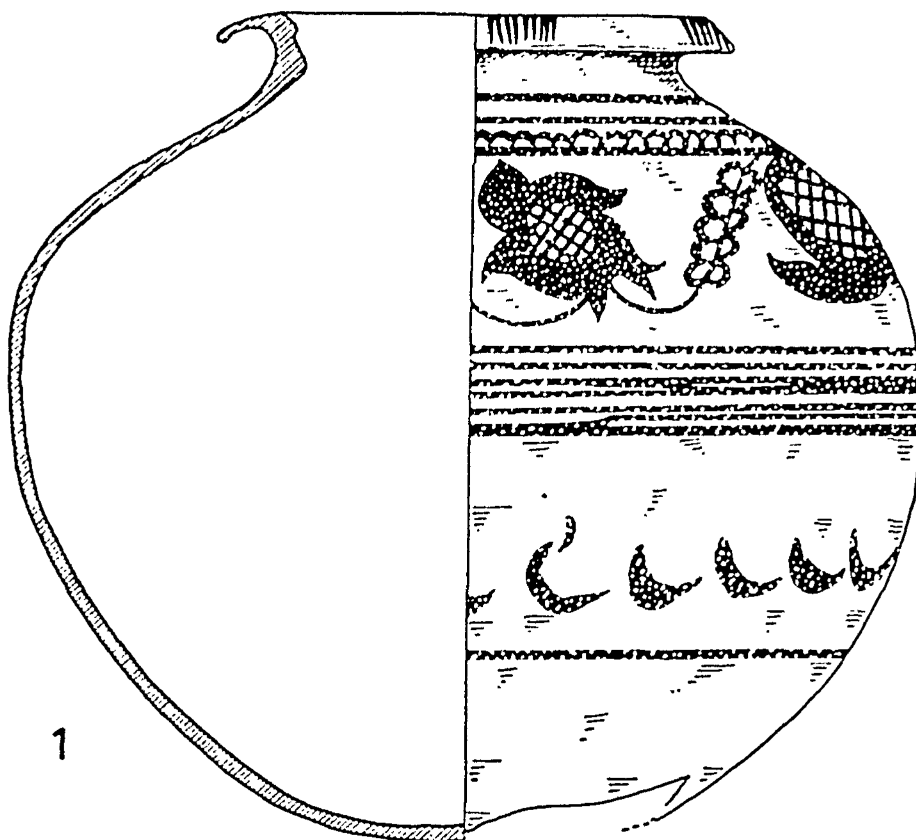


Fig 54 1/4 Globular pots Type 1Bc variant 6
1) II 1, 2) I A8, 3) II 1, 4) I A7, 5) I B5

The vessel fig 62 1 with a short and stunted neck is unique — it is very poorly made.

Fig. 62:2 illustrates a singular vessel with very narrow mouth, straight neck with a nominal ridge outside, and wide shoulders which give the vessel a squat appearance. The fabric is coarse and gritty.

Another rather "awkward" vessel is illustrated fig. 63 and was found at the topmost level. It has a noticeably short neck and lacks the usual graceful, incurved line. The rim is thick, flat and horizontal. It is smaller than the large painted vessels but larger than those of medium size described above. The painted design on this vessel cannot be related to that of other painted pots



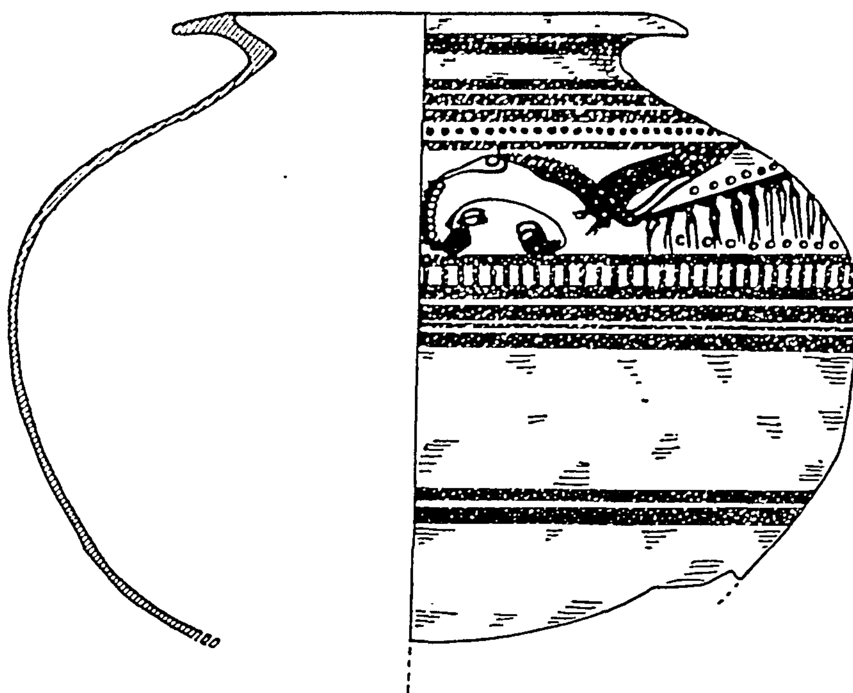


Fig. 55. 1/4. Globular pots. Type 1Bd.
1) (pl. 27:1) I:A^{v} Pit 20; 2) (pl. 30) I:A^{v} Pit 20.

Fig 56 1/4 Globular pots Type 1Bd, variants cf p 94 1) (pl 31 1) I A Pit 10, 2) (pl 31 2) II 1, 3) (pl 31 4) I B Pit 17, 4) I 5, 5) II H6, 6) I A13, 7) I A12, 8) I A5, 9) I B11, 10) I B5, 11) I B Pit 17, 12) II H3, 13) II 5A, 14) I A5

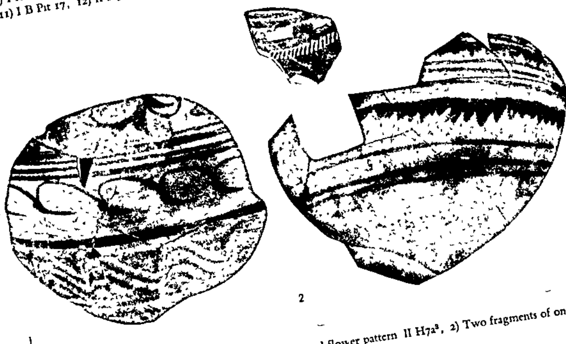


Fig 57 1/4 1) Fragment of big globular pot with black painted flower pattern II H7a^3, 2) Two fragments of one big painted globular pot I B Pit 26 and B12



Fig 58 1/2 Rim of globular(?) pot II:14.

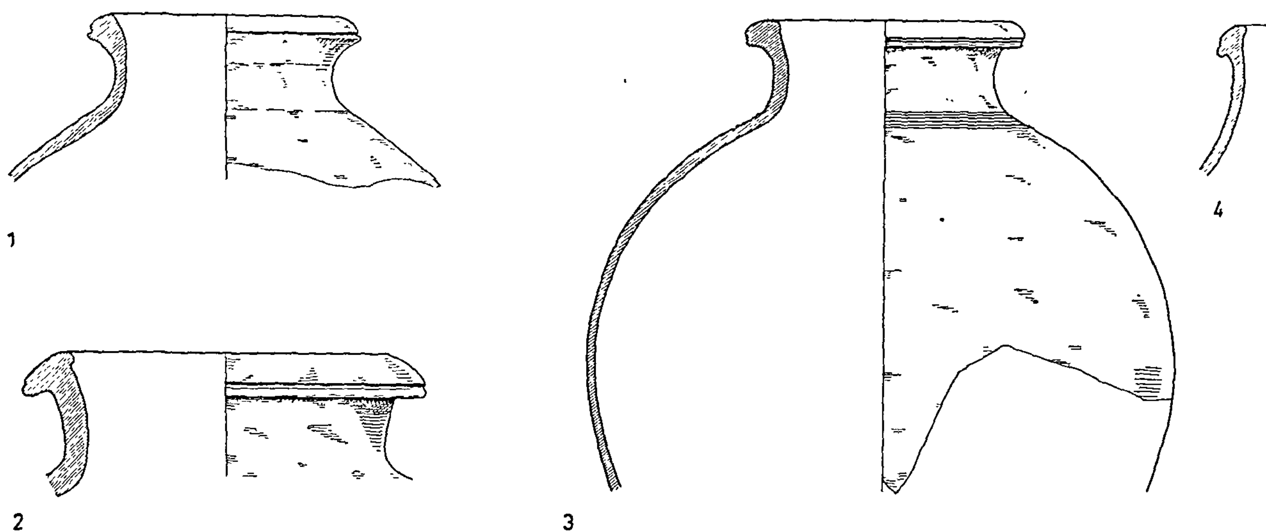


Fig. 59. 1/4. Globular pots of Type 1 A with grooves on the rims.
1) I:A^{v}4; 2) I:B7; 3) I:B10; 4) I:B8.

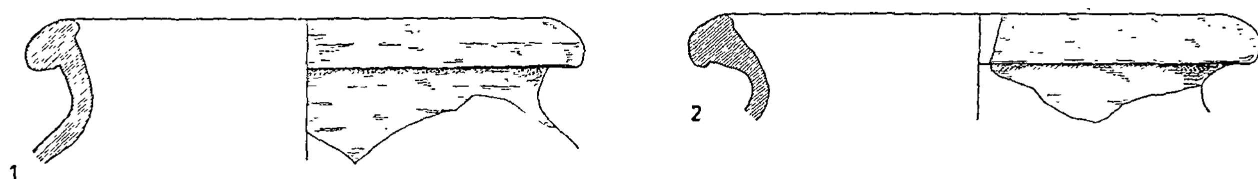


Fig. 60. 1/4. Globular pots with heavy rims.
1) I:B7; 2) I:A8.

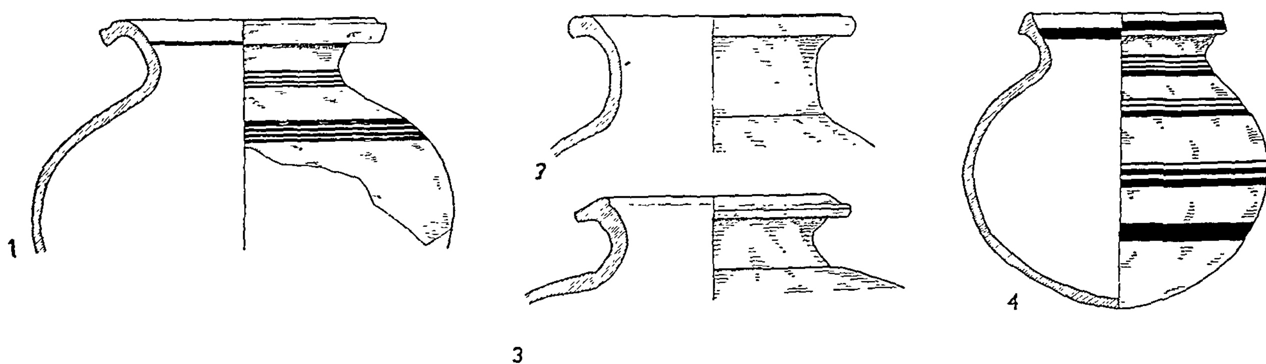


Fig. 61. 1/4. Globular pots.
1) I:A3; 2) II:H3; 3) II:10; 4) I:B11.

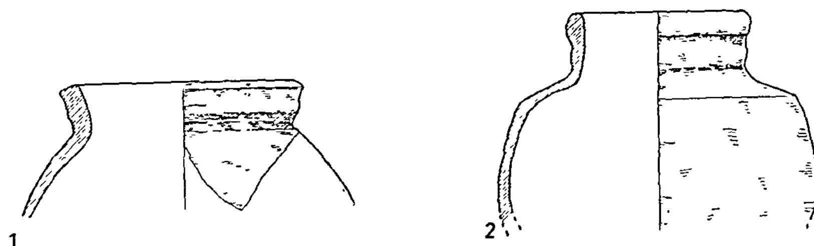
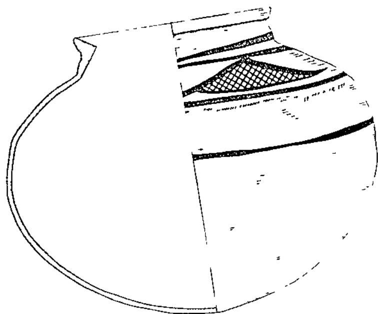


Fig. 62. 1/4. Pots of unique types.
1) I:B11; 2) I:B6.



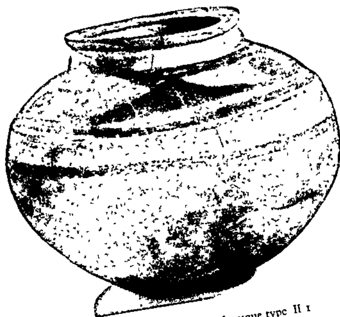


Fig 63 1/4 Globular pot of unique type II 1



Fig 64 1/4 Unique rim of globular pot(?) or cooking vessel(?) II.1

The rim in fig 64 has no analogy, it is neckless and rests directly on the shoulder. It is difficult to decide whether this fragment represents a vessel of the type in question.

I. Applied Ornament.

We have already seen that Type 1B includes many vessels with painted or incised decoration. The main design is usually placed on the shoulder of the vessel. The external surface may be smooth (pl. 27:1, pl. 30, pl. 17:1, pl. 26:1,2,4) or may be covered with horizontal, or wavy, bands of ribbing (pl. 19, the two big vessels pl. 22, pls. 27:2, 28, 29, 32:2).

On occasion the shoulder of a vessel of Type 1A may exhibit a zone of wavy ribbing (pl. 16:3 and 4). A fine example of this type is illustrated in pl. 32:1, here there is an applied band of ripple ornament at the shoulder below which are zones of wavy and horizontal ribbing. The horizontal ribbing of the vessel illustrated in pl. 41:1 is broken by large arc-shaped strokes.

Frequently two zones of decoration are separated by a band or two of applied finger-tip-and-thumb impressions or a rippled band executed with a nail or thin rod (pl. 17:2, pl. 20, the two big vessels in pl. 22, pl. 24, 33:1, 34:6, 35:5 and 6, 36:2, 37:2, 11, 38:8, 40:4). A simple relief-band with no other decoration is rare (pl. 41:2). Occasionally (e.g. pl. 40:9) the ripple ornament appears just below the neck of a vessel.

II. Painted Patterns.

The painting is almost invariably executed in black on a red or pinkish slip. There are a few exceptions. Two small fragments (which may belong to the same vessel), from trench I:A Pit 27, are decorated in purple on a buff slip, with a zone of three broad parallel lines (type as pl. 38:4).

A fragment from trench II, layer 15, pl. 39:9 and pl. 82:52, has a design in wine-red on a reddish slip. Two sherds, pl. 39:7 and 8, found on the surface, have a wine-red design on a buff slip. One vessel, pl. 25:1, has a yellow line on a reddish slip, round the neck and in the groove. A sherd, pl. 40:7, from trench II, layer 1, exhibits a pattern of three parallel and one curved line executed, in a bluish paint, on a buff slip. On another sherd, pl. 40:6, a design of two parallel and one wavy line seems to be executed in a bluish material on a grey ground; on the sherd illustrated in pl. 40:8 the parallel lines are painted in black on a grey ground.

The finest type of Rang Mahal pottery, that which has a sufficiently high standard of painting to designate the culture to which it belongs "The Rang Mahal Culture", consists of the large painted vessels exhibiting a floral or animal design, executed in black on a red slip.

Type 1B variant a, as we have seen, occurs most frequently on the site. The large majority of these vessels are decorated with a painted design consisting of zones of parallel lines round the neck or shoulder, round the top of the rim and in the groove round the rim (pl. 17:1). A number of the sherds, which are decorated with simple bands of parallel lines, must belong to this group of decorated vessels. Although this simple decoration is a standard pattern there are others, as for instance the wavy line decoration, which is frequent. Pl. 18:2 illustrates a wavy line added below a zone of six parallel lines.

Another sherd, pl. 18:4 (cf. also pl. 18:3), has, in addition to the zones of parallel lines round the neck and rim of the vessel, a design of painted triangles, or leaves, on the flat top of the rim. Yet another fragment, pl. 18:1, has on the rim a pattern of alternate blocked-in triangles and loops; on the neck is a zone of parallel lines, separated by small triangular blobs or minute leaves. On the belly of the vessel occurs a zone of larger leaves. Another large vessel, pl. 18:5, has groups of parallel lines across the horizontal, flat rim and round the neck a band of zig-zag lines within the zone of parallel lines.

Pl. 17:2 illustrates a painted animal motif on the shoulder of a vessel of Type 1B variant a, which has an applied band with cross-hatched incisions unusual in the type (see detailed description below). Vessels of Type 1Ba, which occur in the lower levels, are either unpainted or have a decoration of simple parallel lines. A peculiar ornament found on the same type of vessel can be seen in pl. 18:7. The rim of this vessel has a well executed incised pattern across which are painted a few lines; a painted band appears inside the groove of the rim and on the vertical facet; the neck of the vessel has a band of broad, thick, parallel lines. Unique is also the incised pattern on the vertical side of the rim, pl. 18:8.

The most attractive motif of the Rang Mahal pottery is that which depicts *plants or flowers.* A large lotus is drawn on the vessel illustrated in pl. 28 1 with three open petals and three large half-open, small closed buds. The flowers are bound together by a creeper which may be the "barabhanji", which is usually grown in tanks The "barabhanji" is a prominent feature in Buddhist art in the period between the first century B.C and the first century A D.[1] Similar motifs with "full-blown" lotuses are illustrated in pl. 29 1 and 2, pl 27.1 and 2, and fig 57:1. The first example illustrates a geometrical delineation of four flowers in an hour-glass shape, one of them being given a half twist Half open buds also occur on the vessels illustrated in pl 27.1 and pl. 19·2, on the former the flowers are bound by a creeper with conventionalised branches while on the latter the lotus buds are interspaced by a complicated creeper with small leaves (or buds) and bell-shaped flowers The creepers of the vessel illustrated in pl. 20·2 should be compared with those illustrated in pl 33:3, 34 8 and 40:4. The flower on the sherd illustrated in pl. 35 4 has a cruciform centre and is yet allied to the hour-glass pattern (cf also pl 33 4). The simplified flower of fig 33 1 is possibly a lotus

Pls 22 (big vessel), 24 and 19 1 illustrate vessels which have no open lotuses, but which have two varieties of buds, the first type is similar to those illustrated pl 27.1, but are bound together with creepers separated by a vertical, geometrical design.

Certain smaller, or medium-sized, vessels also have plant decoration One sherd, pl 26·1 (fig. 51 12), bears a creeper with lotus buds below a band of parallel lines which have a row of oblique stripes and pairs of triangular leaves. A smaller vessel (pl. 31 2) has a charming representation of lotus buds and the same buds are to be seen in the vessel represented by pl 38 6 The pattern of the vessel illustrated in pl. 40 2 may also perhaps be interpreted as a lotus motif

The plant pattern of the fragments in pl 37 11 and 34.1 cannot be identified, though the sherds apparently belonged to large vessels

A fragment of a vessel, of medium-size but unknown type, with applied band decoration has a devolved plant motif and is illustrated in pl 35 6

A single smaller vessel (pl 20 1) is decorated with pairs of leaves with crossed stalks A fragment of another vessel of similar size has a pattern of double leaves without stalks (pl 40 3)

Different conventionalised leaf patterns are illustrated pl 19 1, 31 1, 38 5 and fig 56 5.

Animal and bird motifs are also found on this pottery Let us start with the birds, chiefly because they occur most frequently, and secondarily because a small fragment was found (pl 36 1), decorated with a rather charming swimming bird in a naturalistic position, in the lowest level of I (B 14).

A more stereotyped swimming bird can be seen in pl 37 6

A fragment of a jar of medium-size, the neck of which is missing, shows a row of birds hopping or flying round the shoulder of the jar (pl 36 3)

The four birds on a sherd from the neck of a jar of Type 1Bc (pl 25 3) are not dissimilar in design Unhappily the jar is broken and only the upper part of the motifs between the birds can be seen. At first view this motif looks like a plant-pattern but most of the "leaves" are cross-hatched in the manner of the bird's wings of comparative pieces A dot in the middle gives the appearance of an eye (notice in this connection the three small birds with minute heads in the large plant in pl 37·11).

An exceptionally graceful ornament is the portion of a peacock which appears to be picking at a large plant (pl 37:1, cf below pl. 17 2)

Unfortunately most of the bird motifs are known only from such small sherds as those illustrated in pl 37 2—5,7 and 8. The head of one bird (pl 37 4) is cocked in the same strange manner as that illustrated in pl 36·4 — it is a rather stylized bird It is unfortunate that the fragments do not show complete wings. The small circles between the birds resemble those on the sherds illustrated in pl 35 6

These birds are analogous to those illustrated in pl. 17.2, where five stylized birds walk, one after the other, round the sherd Their magnificent wings are raised and half open — the crest on the head probably indicates that they are peacocks A snake is placed between two of the birds, just above the lower border of the field.

[1] I am grateful to Mr Ballabh Saran for pointing this out to me

The scene would seem to illustrate the proverbial enmity between snake and peacock which is described at length in Kalidasa's work and the Panch tantra.[1] The peacock is always victorious. In the first picture the snake is about to attack the peacock — in the subsequent panel the snake is taken in the beak of the peacock and shaken like a worm, and is finally torn into pieces.

Another figure, pl. 37:9, shown with an udder-like appendage must be a similar bird to that described above. The head and beak are similar and the beak holds a snake; the figure is surrounded by small circles and the body is hatched, though the lines lean to the right instead of as generally to the left.

Pl. 30 (fig. 55:2) illustrates a most peculiar motif, unfortunately it does not survive in its entirety. On the shoulder of the vessel are two fabulous animals or birds placed in line. Their fore-quarters resemble those of the birds illustrated in pl. 17:2 and pl. 36:2. The head can only be seen on one of the animals, where it is turned upside down and holds a snake-like object in its beak. This snake is similar to that held by the birds in pl. 17:2 and it is possible that the same theme is depicted. The animals have been drawn with a long thin body and fifteen pairs of legs — like a centipede or a dragon. This may be due to the playful fancy of the painter.

Quadrupeds are only represented on two vessels from Rang Mahal and these are delineated in a manner foreign to the Indian art of the period. Four slender animals of unidentifiable species, with elegantly curved legs, are seen galloping round the shoulder of one vessel, pl. 21:1 (fig. 48:1). It may be noticed here that animals with curved legs are known from Sassanian art.

Another animal is illustrated on a fragment on which the painting is rather badly obliterated, fig. 49. It stands with a slightly raised forleg and seems to be grasping another animal below its feet.

We have already seen that occasionally it can be difficult to distinguish leaf motifs from proper geometrical designs. There are many pure *geometric patterns* on the Rang Mahal pottery — triangles, concentric circles, wavy lines, loops, chequer patterns and ladder motifs are all illustrated e.g. in pl. 39, 40 and fig. 57:2). We have noticed (p. 99 above) the unique pattern on the jar illustrated in fig. 63 — here a vine ties together three roundels between which are series of elongated triangles with concave sides, the motif being enclosed within horizontal stripes. With the eye of faith it is possible to see these as strongly conventionalised flowers and leaves — the roundels and triangles for instance are cross-hatched in the manner of the flowers and animals of other vessels. Below this zone is a row of comb impressions and below this is painted another broad horizontal stripe. The surface of the jar has a red slip of usual colour and character.

Of the jars described so far, few have been decorated with *incised patterns*. The vessel illustrated in pl. 17:6 has already been mentioned and the similar vessels in figs. 46:4, 54:1—5 should be mentioned here; they have a finely worked pattern on a rim of Type 1Bc. Fig. 54:5 illustrates a sherd with an incised wolf's-teeth pattern. This design is rare on this type of vessel but is common on cooking-vessels and sometimes occurs on spouted jars.

A unique pattern in our material is to be seen on fig. 50:6 and a similar pattern is repeated on the dish illustrated in fig. 86:10.

The flower incised on a single fragment, pl. 40:10, is the only naturalistic incised pattern within the corpus of material.

Type 2. Carinated Vessels, pl. 42, fig. 65.

Only a few carinated jars are known from the Rang Mahal excavations; these are represented by fragmentary, often very small, sherds and are not found in the lowest levels. In the inside of the pots fig. 65:1,2 below the carination can be seen the marks of the fingers or instruments which gave the vessels their form.

These two largest fragments preserved are decorated on the shoulder and body with painted parallel lines.

A fragment illustrated in pl. 42:3 has on the carination a small relief band decorated with simple oblique incisions. On the shoulder and body are painted zones of parallel bands and there is a row of carelessly drawn leaves on the shoulder. The neck is slightly concave, the rim is missing and the fabric is poor and has a pinkish slip.

One fragments is decorated with a unique design of a row of small lotus buds on a pink-yellow slip, fig. 65:4. They form a line in a border above the carination. The end of each bud is twisted upwards, half way round

[1] I am grateful to Mr. Ballabh Saran for this reference.

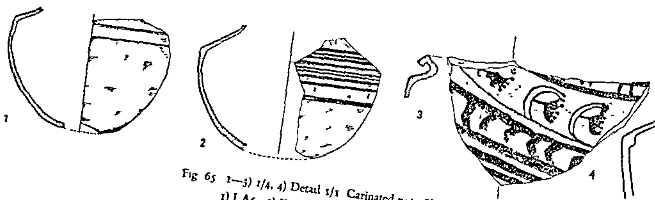


Fig 65 1—3) 1/4, 4) Detail 1/1 Carinated pots Type 2
1) I A5, 2) II 8, 3) II 8, 4) I A Pit 10.

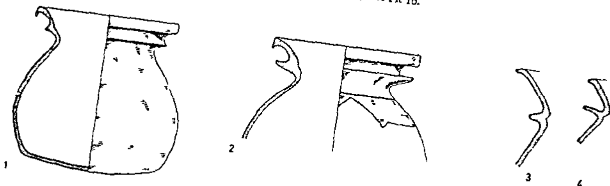


Fig 66 1/4 Flask-shaped pots Type 3
1) (pl 43 1) I Av Pit 20, 2) (pl 43 2) I B Pit 14, 3) I B5, 4) I·A13

from the natural position on the stalk There are indistinct traces of another pattern, possibly a ladder-like motif, below the carination. Other fragments (e g pl 42) show geometrical patterns or small triangular leaves of a type seen on the globular vessels.

One vessel, the neck of which is missing, has no decoration save a single groove at the carination A groove of similar character occurs on the spouted jars (pl 45 1—4) and this feature, with the similar fabric and slip, perhaps indicates that this fragment was also part of a spouted jar

Type 3. Flask-shaped Jars

Pl 43·1 (fig. 66:1) illustrates a very striking type of jar It is distinguished from the globular pots in that the greatest diameter of the body is nearer the large, flat base of the vessel The neck has a prominent ridge below the everted, slightly overhanging rim, there is also an internal groove at the neck The dark red slip of the example of gritty ware in pl. 43:1 gives a well-finished impression to the vessel. A design on the surface of the vessel is of especial interest as it may possibly be the potter's mark This specimen came from trench I, Av Pit 20, fragments of two similar jars were found in the same pit.

The fragmentary jar, illustrated in pl 43:2 (fig. 66 2), while being of the same type, has walls which slope at a greater angle and a ridge which is so prominent that it has the appearance of a collar. The fabric is not so gritty but the slip is the same colour. Fragments of two similar jars were found in I B, Pit 14

Fragments of a good number of vessels of this type have survived, e g. pl 43·3, fig. 66·3,4; they mostly occurred in the middle levels, although a few were found deeper down The type was found in I A3, Av Pit 20, A 6, Av6, B Pit 14, in II:7,8 (4 specimens), III, V, IX, X (3 specimens), P (5 specimens), H 5, H 6^3, H 7^2, H 8, H 10.

Type 4. Spouted Jars.

Pl. 44:1 (fig. 67:1), pl. 44:2—6, pl. 45:1 (fig. 67:4), pl. 45:2, fig. 67:2, pl. 45:3 (fig. 67:2), pl. 45:4—6 (fig. 67:3), pl. 45:7—9, pl. 46:1,2 (fig. 67:6), pl. 46:3,4, pl. 46:5—7, pl. 47:1—2 (fig. 67:7,8), pl. 47:3,6,4,5, (fig. 67:10,11).

Spouted jars are found in large numbers throughout all levels at Rang Mahal. There are a fair number of complete or nearly complete vessels and there are a great many spouts and rim-sherds which can probably be ascribed to the type. There are several types of spouted jars. They have all one thing in common: they are all without handle. The most common type is the series of globular vessels which can be divided, on the basis of rim and base forms, into a number of variant types. The most striking form is that with the representation of a human face. Another interesting type (of which there are several variants) is the jar with narrow, profiled neck.

Finally there are a number of isolated specimens with individual characteristics. There are many details which can relate the different variants to each other.

There are two main variants of the globular spouted vessels — they both represent vessels of similar size and dark slip. *Variant 4A* (pl. 44:1—4) has a rather coarse fabric. The greatest diameter is below the centre of the jar and the neck is straight and not too high; the rim is everted. The spout is either long, and somewhat pointed, or short, of the type described under variant 4B. The rim may have a rounded edge, pl. 44:1 (fig. 67:1) or it may be flat and vertical with a groove round the top (pl. 44:3). The greatest bulge of the two vessels illustrated in pl. 44:3—4 is near the base and the walls drop steeply away from the neck.

Variant 4B, pl. 45:1—4,6, has a somewhat finer fabric. The greatest diameter is above the middle of the jar, the neck is short, usually with external ridges, and the rim is incurved. The spout is very short and is sometimes surrounded, where it meets the wall of the vessel, by a small applied band which terminates in a small button at the bottom. The shoulder of the jar is decorated, on the same level as the spout, with one, two or three grooves. The rim of the vessel illustrated in pl. 45:1 (fig. 67:4) has the same profile as the smaller globular vessels (not spouted jars) of Type 1Bb (fig. 48:2). The rim of another vessel, pl. 45:6 (fig. 67:3), can be compared with the globular pots of the type illustrated in fig. 50:1—4. The ridge at the neck of another example, pl. 45:2, is less prominent and the rim of this vessel has external beading.

The body of another jar, fig. 67:2, is rounded but curves angularly at the grooving; the rim has internal beading.

Variant 4C, pl. 45:8—9. The third variant is intermediate between 4A and 4B and is also related to 4D. It has its greatest bulge above the middle of the jar but it has a flattened, slightly angular shoulder. The spouts are missing from all examples and consequently we know nothing of their shape. There is decoration of wolf's-teeth shape below the neck of one vessel, pl. 45:8. A similar decoration occurs on those jars which take the shape of a human face (variant 4 D1). The rim of the vessel illustrated in pl. 45:9 is also related to that of variant 4D.

Variant 4C1, pl. 46:6. This jar is difficult to classify; it has traces of resemblance both to var. C, D and E. The upper portion of one jar, pl. 46:6, is similar to that shown in pl. 45:8 but the body slopes more quickly towards the base, which makes it suggestive of the jar pl. 46:5. The neck is similar to that of type 4D and it is probable that the missing rim was very similar. The spout is missing, but a series of painted loops ring the base of the spout indicates a shape as that on the jar pl. 46:2.

Variant 4D, pl. 46:1.

Variant 4 D1 pl. 46:2—4. This type, in which the spout becomes the central element of a human face, is represented by three examples from I:A^{V} Pit 20. The obvious origin of these features can be seen in a vessel as that illustrated in pl. 46:1, var. D. The three vessels illustrated are of the same general appearance but differ in detail: the body bulges, the base is flat and they have a rather high, straight neck with out-turned rim. The spout forms the nose of the face; it is pointed and has a bulge at its base. The base of one spout, pl. 46:4, is surrounded by a chain-like applied band; another applied band crosses the pouch-like bulge. The eyes are purely ornamental and are executed in low relief. In one case, pl. 46:3, they are quite round and have no eyebrows while in another, pl. 46:4, the eyes are smaller but are topped with a double semi-circular band. The oval eyes of the third specimen,

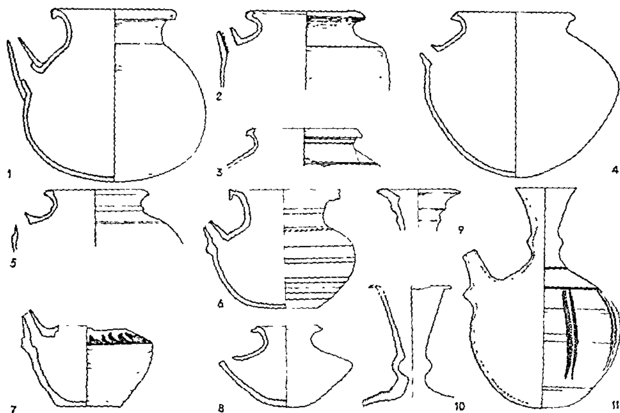


Fig 67 1/4 Spouted jars. Variants of Type 4

1) (pl 44:1) I.B10, 2) (pl 45 3) I Av2, 3) (pl 45 6) II 1, 4) (pl 45 1) II 11B, 5) IAv Pit 20, 6) (pl 46 2) I Av Pit 20, 7) (pl 47.1) I·A1; 8) (pl 47 2) I A1, 9) II 6, 10) (pl 47 4) H6, 11) (pl 47 5) I B Pit 18

pl. 46:2, are the most naturalistic of the three and are surrounded by black, painted lines, similar lines indicate the eyebrows. The lower part of the spout of this pot is also decorated with four painted, horizontal lines. All these vessels have parallel grooves on their bodies and those of the vessel illustrated in pl. 46 4 are especially noticeable. There is a lowplain relief band where on this example the body rises from the flat base. Two vessels, pl. 46·2 and 3, have an incised wolf's-teeth decoration round the neck. Each rim is grooved round the vertically over-hanging edge

No complete vessel, or large fragment, of this type has been found in other parts of the excavation However the base of a jar from trench II, layer 2[1] resembles the bases of the vessels figured in pl 46:2,4. The wolf's-teeth decoration occurs on fragments from trench I B5 and B9 and these sherds appear to belong to jars like that illustrated in pl. 46:3 There are a fairish number of rim sherds from trenches I and II which are of the same form as those on the face-jars The sherds are not found in the earliest levels and it is difficult to know whether they belong to variant 4D or 4C or some similar form. Certain spouts with pouch-like bulges were also found but these may belong to such vessels as the one on pl 47·5 (fig. 67 11).

Variant 4E, pl. 46.5, is a small graceful jar on ring base. It has a very narrow neck with a flaring, out-turned rim. The main features are similar, however, to variant D—D1 (face-jars). The shape of the neck pl. 46·7 is similar to that on the jar in question, but the rim edge is different Pl. 46.5 comes from II 13, pl 46 7 from I·B7.

Variant 4F, pl. 47:1,2 (fig. 67:7—8). The body is carinated at a sharp angle. The vessel, pl 47·2, has a narrow neck and the flat, out-turned rim is offset at the edge, which is decorated with painted, triangular leaves Round the base of the spout, which is missing, is painted a black wavy line The neck of the other pot is missing, there

is a pouch-like bulge at the base of the spout. There is horizontal ribbing below the carination and above it is a painted band of triangular leaves. Black lines are painted on the spout and around its base.

The spouted jar pl. 69:14 will be described with the moulded pottery.

Variant 4 G, pl. 47:3—6, includes spouted jars which have funnelshaped or conical necks, one type of neck, which, though it may differ in detail, is very common. It is very narrow and fixed separately to the body of the jar. The joints on the outside face are then covered with clay and smoothed out; as a result the method of manufacture can only be seen when the vessel is broken.

The only complete vessel of this type, pl. 47:5 (fig. 67:11), has a funnel-shaped neck and a fine quality painting in black on a red slip. The spout is of the same type as variant 4D—D1.

Variant 4 G1. The fragments of the jars, pl. 47:11—13, 15, which have the same red slip as the vessel illustrated in pl. 47:5, have black, painted ornaments on white ground over the joint between neck and body.

One small fragment of fine ware with a red slip, pl. 47:9, (fig. 68:8), has a spherical spout of some interest.

One fragment with a brownish slip comes from a low level, otherwise the type seems to belong to the upper levels.

The fragment of the moulded jar, pl. 69:13, is not to be forgotten in this context; the presence of an internal groove indicates that it belongs to variant 4G, although we do not know the form either of its rim or its spout.

Variant 4H, pl. 48:1, 2, 5, is heavily made and has horizontal or wavy ribbing and conical or funnel-shaped neck. Only three fragmentary jars enable us to gain an impression of the shape of this type. The neck is attached to the body in a manner similar to that which characterises variant 4G. In fig. 68:9 and 10 we can see how the neck was attached to the body, in the former there is a double joint at a and b while in the latter there is a single joint. The jointing cannot be seen outside the jar as it is smoothed over with a layer of clay. The first of these two jars, pl. 48:1, has had a funnel-shaped neck (as pl. 47:3—6) and a pointed spout with a pouch-like bulge. Another vessel, pl. 48:5, has a conical neck with a narrow, nozzlelike mouth; the spout, on the other hand, is wide and open. The conical neck of the fragment illustrated in pl. 48:2 (fig. 68:10) has a well-defined profile. Other fragments illustrated in pl. 48 show a series of different neck forms. The closed, conical necks surely belong to this variant. The thick fabric of the necks with more widely open mouths makes it probable that they also belong to such jars, which also appears from the comparison between pl. 48:12, 13 and the jar-fragment from Bhamantheri, fig. 102:2. The type is found at all levels at Rang Mahal.

Variant 4I, pl. 48:11, resembles variant 4H in shape of body and neck, but the fabric, though quite heavy, is of another quality altogether. The spout with the broad band round the mouth is unique and is placed in an unusually low position on the wall of the jar at a right-angle. The neck, although found separately, belongs to the jar.

Variant 4J is represented only by a spout, pl. 47:16 and pl. 82:55, in the shape of an animal's head. The shape of the jar is unknown. The fabric is rather heavy and it carries a bright red slip with black painting along the nose, round the eyes, and in the eyes (where it represents the pupils). Between the eyes is an applied round mark. (Trench II: H5[1])

Variant 4K, pl. 47:8. The detailed shape of the jar is not known, it was probably a globular vessel with a pointed spout and pouch-like bulge at the base. It is recognised here as a variant although its ware is so different from that of the other spouted pots. It is more like the Red Polished Ware of the sprinklers.

Type 5. Sprinklers=Red Polished Ware.

Pl. 49:1, 2 (fig. 68:1), pl. 49:3—6, (fig. 68:2), pl. 49:7 (fig. 68:3), pl. 49:8—13, pl. 50:1 (fig. 68:4), pl. 50:2—10 (fig. 68:5), pl. 51:1, 2, fig. 68:6, 7. The sprinklers at Rang Mahal were executed in the well-known Red Polished Ware; we have many fragments but no absolutely intact specimens.

Variant 5A. During the course of excavations we found sufficient fragments of this type of vessel for the complete form to be reconstructed. One example, pl. 49:1, where the body is complete, but the neck missing, is oval in shape and it seems fairly certain that this type of vessel has the narrow, but open, mouth of the type illustrated in pl. 49:2. The rims vary (cf. pl. 49:3—11); for instance, the vessels with wider mouths have lower rims and there are a number of varieties of broad rim. Vessels of variant 5A have an air channel through the neck; in those

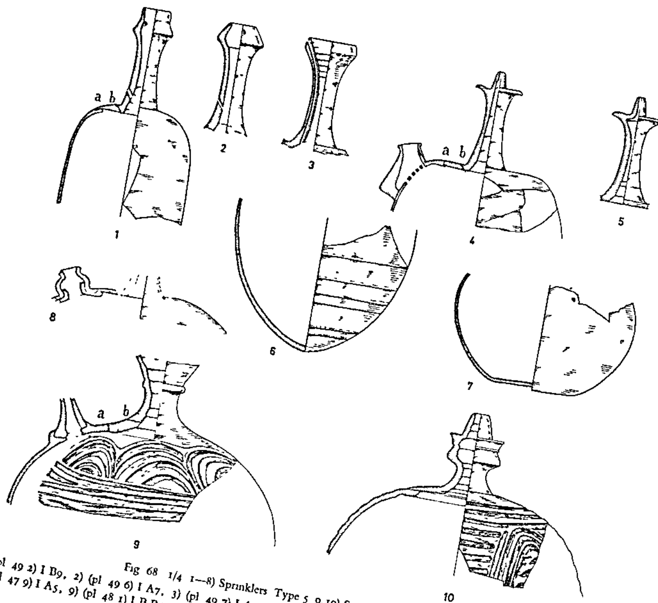


Fig 68 1/4 1—8) Sprinklers Type 5 9,10) Spouted jars Type 4 H
1) (pl 49 2) I B9, 2) (pl 49 6) I A7, 3) (pl 49 7) I A 13, 4) (pl 50 1) II 15, 5) (pl 50 10) I A5, 6) I Av Pit 20, 7) I A7,
8) (pl 47 9) I A5, 9) (pl 48 1) I B Pit 14, 10) (pl 48 2) I B9

vessels which have wide mouths thus passes right through the neck, following the curve of the neck from top to bottom (fig. 68,3). Those vessels which have narrow mouths have a very short air channel, consisting of a small hole at the base of the neck (fig 68 1 and 2) This type has no spout

Variant 5 B has a closed mouth with a small hole at the top, it has a spout Although no complete vessel survives it is possible to reconstruct the type by combining the fragmentary vessels illustrated in pl. 50.1—3 The vessels represented in pl. 50·1 and 2 seem to be rather more squat than the third sprinkler referred to. The form of the body of one vessel (pl. 50·2) is oval, we do not know anything about the shape of the bottom of the other two examples; it is possible, however, that the vessel illustrated in pl. 50·1 had a flatter base, as that illustrated in fig 68·7 Both flat and slightly concave bases of red, polished ware occur. The spout typical of this form is illustrated in pl. 50:1 (fig 68:4); we have many loose spouts of this shape with an internal strainer

A series of different necks is illustrated in pl. 50 4—10 and pl 51.1—2 It seems impossible to classify these necks typologically as each of them seems to have had an individual finish With one exception (pl. 50.2) these vessels have no air channel, a feature that would not be necessary in a spouted vessel of this type

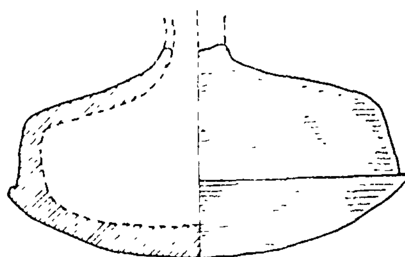


Fig. 69. 1/2. Pot of stove-like shape Type 7 (pl. 51:4) I: B6.

These polished sprinklers with their long necks are manufactured from two or three pieces, in a similar manner to the necks of variant 4G. The broken polished sprinklers illustrate the method of fixing the neck to the shoulder and the shoulder to the body by means of a groove (fig. 68:1 and 4). The joints are covered by clay which, being smoothed over externally, hides the method of manufacture in an unbroken specimen.

In general the fabric is thin, well-baked, hard and well polished. The colour is usually a brilliant red, although it is sometimes yellowish, dark brown or even black. One neck, pl. 49:5, is of a whitish, kaolin-like, chalky material. Some fragments however are coarse (e.g. a pointed base, fig. 68:6, marked with parallel, horizontal strokes).

The two variants, those with open and closed mouths, are found in the same horizons of the excavation. They are most frequent in the lowest layers and decrease in number in the middle layers, being rare, although not entirely absent, in the uppermost levels. The type with the wide, open mouth and low rim (pl. 49:7 and 11) only occurs in the lower levels. The sherds of this ware at Rang Mahal were usually very small, yet fragments of about a hundred sprinklers were found.

Variant 5C, pl. 49:12—13. This variant is represented by a strange neck-form of coarse fabric; the shape of the vessel to which it belonged is not known, although it may be similar in form to the sprinklers.

The vertical hole through the neck is replaced by a warped orifice below the rim which leads to a spiral groove round the outside of the neck.

It is impossible to say whether these vessels were intended for utilitarian purposes or whether they were the product of a practical joker's imagination. Whatever the case, one of the examples reveals that the hole did not completely pierce the wall of the vessel and the vessel was certainly not complete.

Type 6. Grey Sprinkler.

Pl. 51:7 illustrates a unique specimen, found on the surface, which is made from a grey micaceous clay.

Type 7. Stove-like Vessels.

Pl. 51:4 (fig. 69) and pl. 51:5 illustrate a strange type of vessel which resembles the form of a modern kerosene stove with a very narrow mouth. The form of the rim is not known. Of the two specimens found one came from the surface, the other from I:B 6.

Type 8. Triangular Flask (Pl. 51:3).

This is another strange and unique vessel: it has a triangular body of oval cross-section, it has small loops below the neck which presumably carried a cord. The surface shows the regular marks of a slow wheel. The slip is of a dirty yellow colour. The vessel comes from I:A 5.

Type 9. Vessels with Textile Impressions Pl. 52:1 (fig. 70:1), pl. 52:2—4, fig. 70:2—12.

In form these vessels resemble the common cooking-pots — whether they were used for this purpose or not is unclear. The most striking features are 1) the crude lower part, which is covered with a wash of closely packed

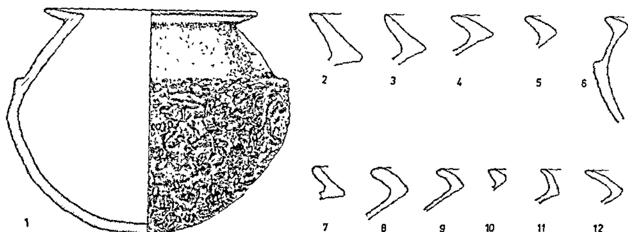


Fig 70 1/4. Pots with textile marks. Type 9
1) (pl. 52 1) I B5, 2) II 15, 3) I B6, 4) I B10, 5) I A9, 6) I B Pit 24, 7—8) I A10, 9) I B12, 10) I·A9, 11) I B10, 12) I A10

grains of sand or even small stones and 2) the impressions of textiles on the fabric. The vessels are not wheel-turned, but have been shaped over a form which was covered with cloth; impressions of textile thus survive inside the vessel Although the interior of the vessel was covered with a wash of clay this was either so thin that the impressions show through, or it has flaked away to reveal the underlying impressions.[1] The ware of this type of vessel is badly fired and heavy, the clay often has an inmixture of husks The upper part of the vessel is sometimes covered with a red slip but the colour is usually grey-brown The vessels have a more globular form than the cooking-pots found on the site they are spherical from shoulder to shoulder, save only from a ridge below the shoulder. The ridge can be a broad or narrow shelf, pl. 52 1 (fig. 70 1), it can slant inwards to form a deep groove, pl 52:3, or it can be rounded and less prominent, as in the example illustrated in pl 52:2, where the ridge has a simple decoration of holes pricked with a pointed tool. The rim form also varies, it can be turned out at an angle from the shoulder and it can be flat and horizontal, fig 70 1, it can slant at a variety of angles, and it can be quite small, fig 70 6 and 10, or quite large, fig 70 2 The various rim forms are illustrated in fig 70.

These vessels have no decoration apart from those features which we have just described. There were a hundred and fifty examples from trench I as well as fragments of four vessels of the same type without textile impressions Type 9 is found in layers A^v3 to A 14 and B 5 to B 14, occurring most frequently in the lower levels, especially layers 8—12. In trench II remains of twenty-nine vessels were found, as well as three of the same type with no apparent textile impressions. Vessels of this type appear at all levels, but are most frequent in the lowest horizons.

Type 10. Cooking-vessels

Pl. 53:1 (fig. 71.19), pl 53 2 (fig 72.5), pl 53 3—5, pl 54 1,2 (fig 71 2), 3 (fig. 71:1), pl. 54:4 (fig. 71 3), pl. 54·5 (fig. 71.20) pl. 54 6, pl. 55 1 (fig 72 1), pl 55 2 (fig 71 15), pl. 55 3 (fig. 72 4), pl. 56:1—3 (fig 72:12), pl 56:4 (fig. 72:3), pl 56·5,6, pl. 57—61, fig 71 4—14, 16—18, fig 72 2,6—11, 13—24, fig 73—75.

The main group can be divided into two, one group (10A) comprises vessels with no decoration, save for occasional incised grooves round the neck, and the other group of vessels (10B) is decorated.

Variant 10 A has a splayed rim at a rather acute angle, fig 71 3, occasionally turning out in a curve, fig 71·4. The shoulder is usually slightly vaulted, pl 54 2,6, and the lower part of the vessel is somewhat globular, pl 53:1, 54:2,4,6. The ridge between the shoulder and the body is usually not very prominent, pl. 53·1 (fig 71.19) and is often a little rounded, pl 53·3,5, pl 54 2 (fig 71 2), pl. 54 6, it can however be very high, as that illustrated in fig 71.17. Below the ridge the body is covered with an applied horizontal ribbing, executed in wet clay wash,

[1] A thorough analysis of the method of manufacture of these vessels and of the significance of the textile impressions will be found on p 201

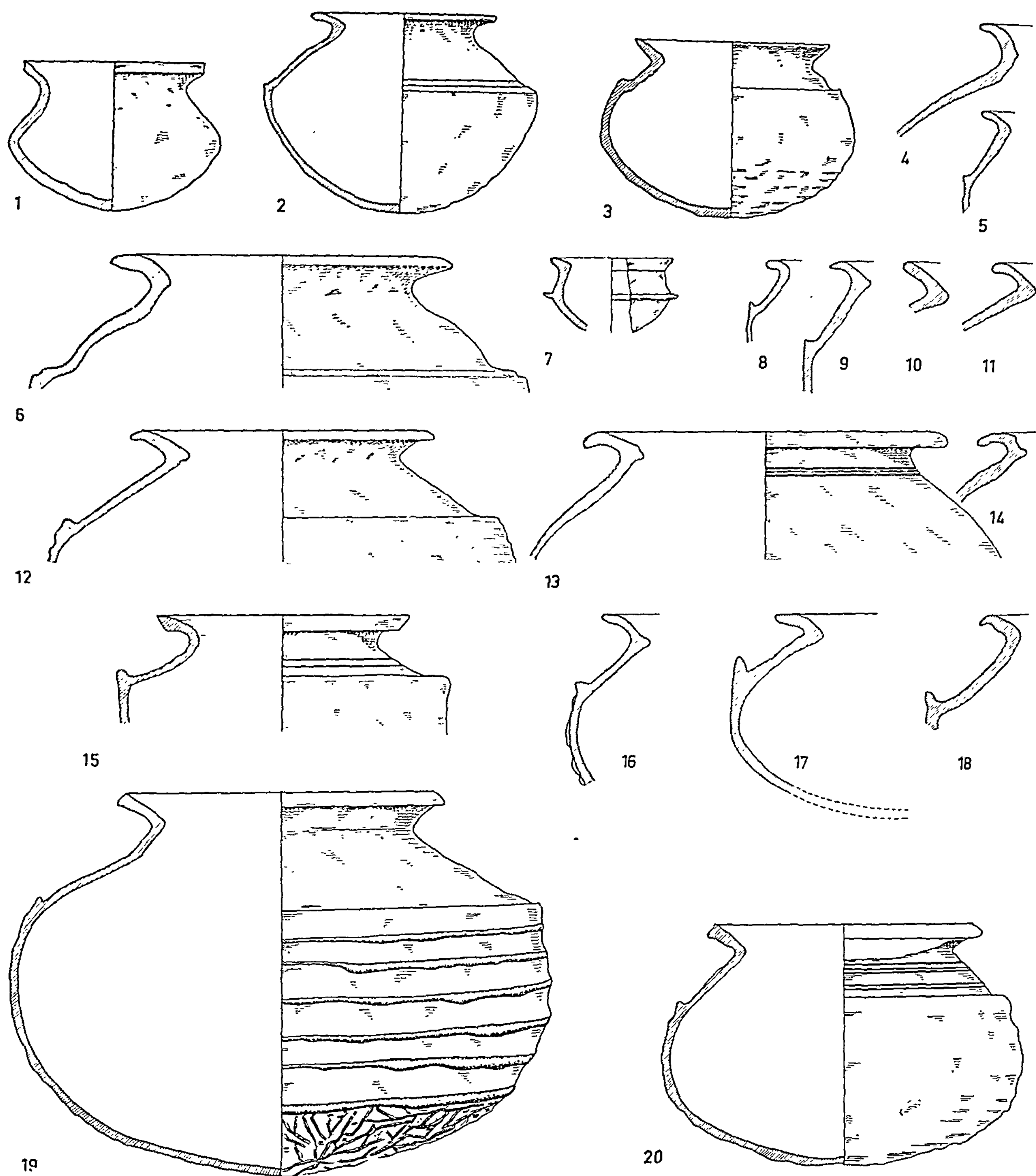


Fig. 71. 1/4. Cooking vessels. Type 10 A.

1) (pl. 54:3) I:B13; 2) (pl. 54:2) I:A7; 3) (pl. 54:4) I:B, Pit 17; 4) I:B9; 5) I:A Pit 10; 6) I:A5; 7) II:IX; 8) I:B Pit 22; 9) I:B5; 10) II:H9^3; 11) II:H7 a^5; 12) I:A^{v}4; 13) II:H3^2; 14) I:A5; 15) I:A^v Pit 20; 16) I:A5; 17) I:B Pit 14; 17) IA^v Pit 20; 19) (pl. 53:1) I:B Pit 18; 20) (pl. 54:5) I:A^v Pit 20.

Fig. 72. 1/4. Cooking vessels. Type 10. Variants cf. p. 113, 116 f.

1) (pl. 55:1) I A^v Pit 20; 2) II: H5^2; 3) (pl. 56:4) II:H4; 4) (pl. 55:3) I: B14; 5) (pl. 53:2) I:A^v Pit 20; 6—7) I:A^v Pit 20; 8) I:A Pit 9; 9) I:B Pit 25; 10) I:B Pit 17; 11) I:B10; 12) (pl. 56:3) I: A^v Pit 20; 13) II:I; 14) I:A^v Pit 20; 15) I:A Pit 3; 16) II:VII; 17) I:B10; 18—19) I:A^v Pit 20; 20—21) I:B 5; 22—23) I:B6; 24) I:B Pit 17.

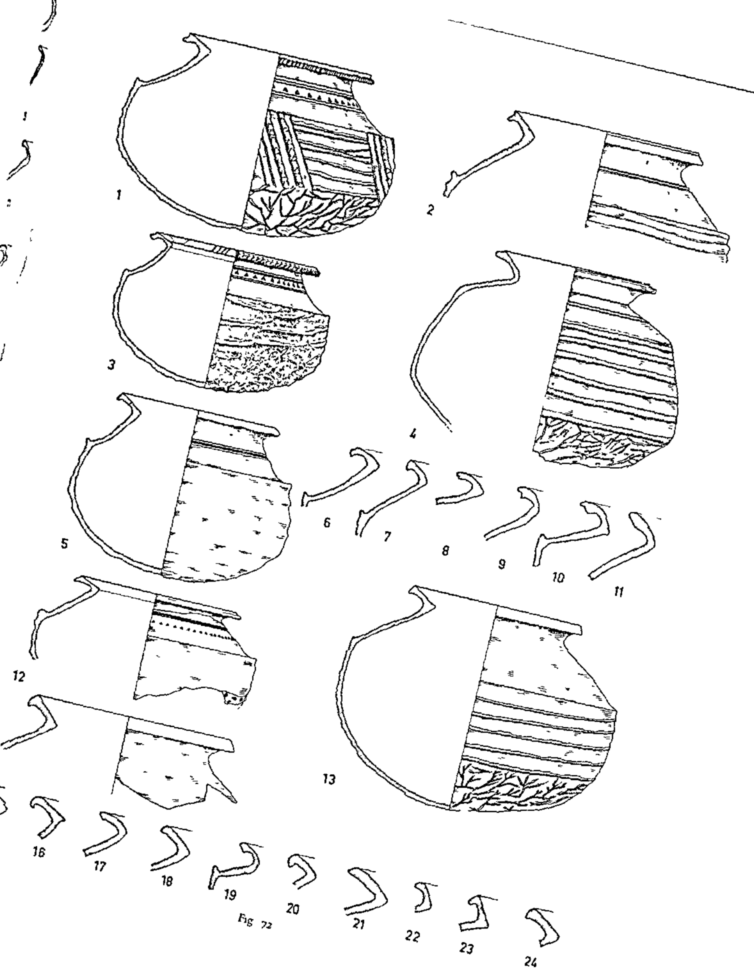


Fig 72

which is sometimes varied into curved strokes, pl. 53:3. The base is patterned in a streaky haphazard manner, as fig. 71:19, pl. 54:6.

The vessels are covered with a slip, which is reddish, yellowish or *pink*; the base is usually sooty. A number of pots differ from the usual forms; as for example one which has a short shoulder and a carination without a ridge, pl. 55:3 (fig. 72:4.) A small vessel of strange shape, pl. 54:3 (fig. 71:1), would not have been taken for a cooking-pot if it did not have a streaky base. A toy vessel of goodish form is illustrated in fig. 71:7; and some few similar examples have been found.

The rim, which is the most striking feature, occurs in two main forms and is used as a basis for typology. A popular form is the rebated, or flange-like, rim which turns slightly downwards below the bead-like lip of the vessel, pl. 54:5,6, fig. 72:2. This type occurs in all levels and appears frequently on the decorated vessels, fig. 72:1. A similar impression is given by the vessels illustrated in pl. 55:3 (fig. 72:4) and fig. 72:6.

Another type, fig. 72:8,9, has a slightly overhanging out-turned rim. The types illustrated in fig. 72:10, 11, which occur mostly in the lower levels, are probably related to them.

The simple rims illustrated in fig. 71:2,6,10—12,19,20, fig. 72:17—19 occur at all levels on the site. The rim illustrated in fig. 72:21 has become very drawn out. The very short rims, as fig. 71:5,8 and 9, do not occur in the lower levels.

A rare feature on the undecorated examples is the groove at the constriction of the neck, fig. 71:12—14, fig. 72:16.

The drooping rim of fig. 72:5 and 24 becomes more accentuated (fig. 72:22 and 23) until it reaches the very clumsy form illustrated in fig. 72:20. Fig. 72:14 and 16 illustrate some variations.

Variant 10 B. There is little variation in shape between decorated and undecorated vessels. The former are usually less high and rounded, pl. 55:1, 56:4 and the bottom is generally more truncated — giving the vessel a squatter form. The appliqué clay wash on the body is more varied, the ribbons occasionally being broken by oblique strokes, pl. 55:1, occasionally the whole wash is applied in undulating or oblique strokes, pl. 57:8, pl. 58:8. The rim can have an extended profile, as in fig. 72:1,3,6 and 12, but can also have the simple curved shape of pl. 55:2, 60:1. The ridge, where the shoulder meets the body, is sharply defined, pl. 55:1 (fig. 72:1), pl. 56:4 (fig. 72:3), or merely a horizontal band, pl. 55:2, 56:3 (fig. 72:12), pl. 56:5, 59:1. The band can sometimes become a huge collar, pl. 60:10—12, fig. 73:1—3, cf. below Variant 10 B 1.

Decoration of the cooking-vessels var. 10 B.

The decoration of cooking vessels consists of incised patterns, relief ornament on the rim or the ridge and painted designs.

In their plainest form the incised patterns consist of grooves round the shoulder of the vessel, e.g. pl. 54:5. Such grooves occur alone or with other motifs and ornaments. The other common form is a wolf's teeth pattern round the shoulder of the vessel, pl. 55:1, 56:3—5, 57:1 or, in exceptional cases, on the edge of the rim, pl. 55:2. This motif is often bordered by grooves and usually occurs with relief decoration or painted patterns, or both, executed on the rim.

In a single case the rim is decorated with a large incised zig-zag line, pl. 53:4.

A well executed relief zig-zag pattern sometimes occurs on the middle of the rim, pl. 61:4,5.

Relief decoration on the edge of the rim is very common, often with oblique incisions of varying lengths, suggestive of a cord, pl. 55:1, 56:4,5, 57:1,3,4. Sometimes the rim decoration gives the impression of lace or of blanketstitching, pl. 57:2,5,7, pl. 58:5,10, pl. 59:4 and pl. 61:2.

The relief band between shoulder and body, which broadens to a kind of ear, illustrated in pl. 61:8, is a rare feature. The few known specimens came from trench I:A 14 and B 14.

A number of vessels have two lugs projecting from the rim: the vessels on which these occur are usually decorated, pl. 56:1,6, pl. 58:2,4,7,11, pl. 59:2,5,7,9 and pl. 60:6. Pl. 57:8 illustrates lugs on an otherwise undecorated rim, though the shoulder has a series of grooves and the body an undulated wash.

Painting on cooking-pots usually occurs on the rim; sometimes on the upper part of the shoulder or in special cases on the projecting ridge. The motifs are, in the main, similar to the geometric patterns on the globular jars and

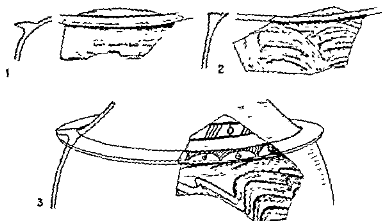


Fig 73 1/4 Cooking vessels Type 10 Variant B 1, cf p 116 f
1) II 1, 2) II IV, 3) II 5

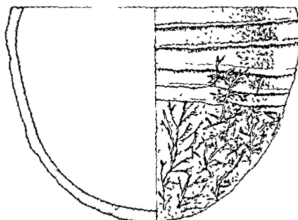


Fig. 74 1/4 Cooking vessel Type 10 C, cf p 118 II 1



Fig 75. 1/4 Cooking vessel Type 10 D, cf p 118.
(pl 59 12) II 4[2]

include horizontal and vertical lines, pl. 58 1,3, borders of dots, pl. 58·3,6, small circles, pl 60·9, circles with dots, pl. 60.8,10, arched and wavy lines, pl. 58·2—11, 61·1—3, and different combinations of triangular leaves, pl. 58·1—3, 10, 11, pl 59, pl. 60 1—8, 11, 12, sometimes with a dotted stalk, pl. 60:6 As can be seen from the illustrations, the different patterns are occasionally associated.

The decorated cooking-pots were found in the upper and middle levels One sherd with traces of painting was found, however, in I.A 14 and another in A 12. A single sherd with relief decoration at the ridge, like that illustrated in pl. 61.8, was found in I B 14, and others with painted decoration in B 7, 8 and 9.

Vessels with prominent, collar-like, projecting ridges are rather rare, they occur only in the topmost levels of trench II and did not occur in trench I It is sometimes difficult to know whether a rim fragment belongs to a vessel with a decorated projecting ridge This form has been named *variant 10 B 1* because it differs so much from 10 B.

Type 10 var. C, pl. 61:12 (fig. 74), is represented by a unique example found in trench II:4[1]. It is rimless but the streakiness and soot of the base leave no doubt as to its purpose.
Type 10 var. D, fig. 75, is a small unique vessel. It is doubtful if it is fabricated as a cooking-pot, the base is however very sooty. It is found in II:1.

Type 11. Pans, or Troughs, with Loop-handles.

Variant 11 A. The fragments illustrated in pl. 61:9 and 10 probably represent the loop-handles of pans or troughs. These are the only examples found and came from I:B 9 and II:v.
Variant 11 B. The fragment illustrated in pl. 61:11 also probably belongs to this class. The grip consists of an oval scrape in the clay.

Type 12. Storage Jars.

Variant 12 A, fig. 76, pl. 62:3 (fig. 77:2), pl. 62:4 (fig. 77:1), pl. 62:5,6 (fig. 77:3), fig. 78.

Fig. 76 represents a large, heavy jar of coarse fabric with a brownish slip. It is elongated in shape and the walls slope directly away from the neck. The rim is clumsy with an out-turned, oval collar; the neck is grooved and surrounded by a plait-like relief band. Fig. *76:1 is probably the base of the jar. It was found below the jar*, which was turned up and down in the small room in trench I, cf. p. 67 f.

The surviving height of the jar is 66 cms. which cannot represent much more than half of its original height. The greatest diameters is 78 cms. and the diameter at the mouth is 29 cms. The wall is between 10 and 15 cms. thick.

The fragmentary jar, illustrated in fig. 78, has surely also had a pointed base.

Variations in the type of relief band are shown in pl. 62:3—6.

Variant 12 B, fig. 77:4, is of similar shape to variant 12 A but has a simpler, oval, collared rim with no relief band round the neck. The fabric is coarse and sandy — there is no slip.
Variant 12 C, pl. 62:1 (fig. 77:6), fig. 77:7,8 is of a lighter fabric. The form is similar to that of 12 A, but the walls slope more rapidly and the diameter at the mouth is larger than the greatest diameter of the body. It has a vertical, ribbed, collared rim which is slightly concave internally, making the neck look like a low bowl; an appearance which is strengthened by the depth of the neck. The fabric is pinkish and there are traces of a slip.
Variant 12 D, pl. 62:2, resembles variant 12 C save that the neck is not internally concave.

The storage jars were found at all levels of the excavation, there was rarely more than a single fragment in each layer.

Type 13. Jars with Pointed Bases.

Variant 13 A, pl. 62:9 (fig. 79). This type of large jar has a pointed base; it has the same kind of applied wash as the large globular jars and can most closely be compared with the large jar illustrated in pl. 22. The form of the upper part of the jar is not known. The variant is known from two specimens found in I: A 5 and A 7.
Variant 13 B, pl. 62:7 is the pointed base of a small jar and is known from two examples only, found in I: A 7 and II:11.

Type 14. Tripod Vessels.

Pl. 62:8 illustrates the base of a tripod vessel which was the only one found on the site; it came from trench I: B Pit 14. A small fragment found in B 14 is possibly the leg of such a vessel.

Type 15. Smaller Vessels.

Variant 15 A, pl. 64:16,15 (fig. 80:1,2) consists of smaller vessels of globular form with small, out-turned, rounded rims. The fabric is coarse and pinkish in colour, pl. 64:16, or red with a trace of external slip, pl. 64:15. The type is not very common and was found in the middle layers.

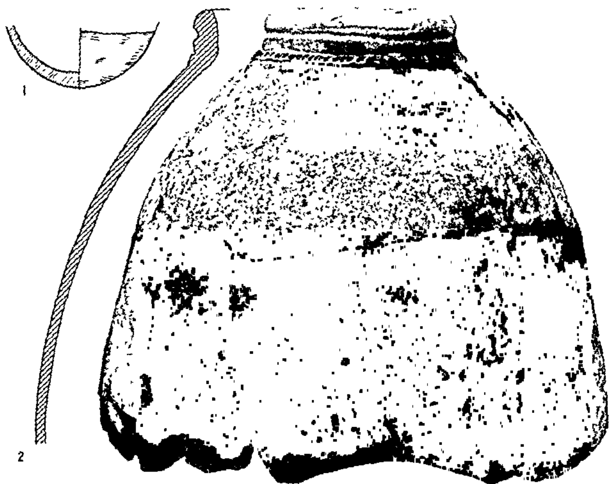


Fig 76 1/4 Storage jar, Type 12 A found up and down in the floor in the house, trench I (cf pl 5 2,3 and p 67)
1) surely the bottom of the jar, which was placed below the upside-down jar I B13

Variant 15 B, pl. 51 6, is a smaller, squat, globular vessel (the narrow neck of the vessel illustrated is missing) At the turn of the shoulder is a series of vertical incisions bordered on either side by a groove. On the shoulder is a painted pattern of joined arcs and just below the neck is a painted pattern similar to the incised one. The vessel has a red slip and is unique

Variant 15 C, fig. 80 3, is a smaller vessel with a flat base a rounded body and an out-turned, featureless rim. The variant occurs quite frequently.

Variant 15 D, fig 81 2, is a vessel with thickened base, rounded walls, with prominent wheel marks, and an out-turned rim which is thickened externally. The fabric is pinkish, lightweight and of much the same type as that of the common conical bowls A fair number of examples were found in both trenches

Variant 15 E, pl. 64.5, is a cylindrical vase with a flattened base. There is one groove near the base and two more higher up. The rim is broken away and the fabric is pinkish in colour.

Variant 15 F, pl. 64 6, is a smaller vase with flattened base, an oblique shoulder and base and a cylindrical body. The narrow neck is broken away The fabric is of medium consistency and there are traces of a reddish slip

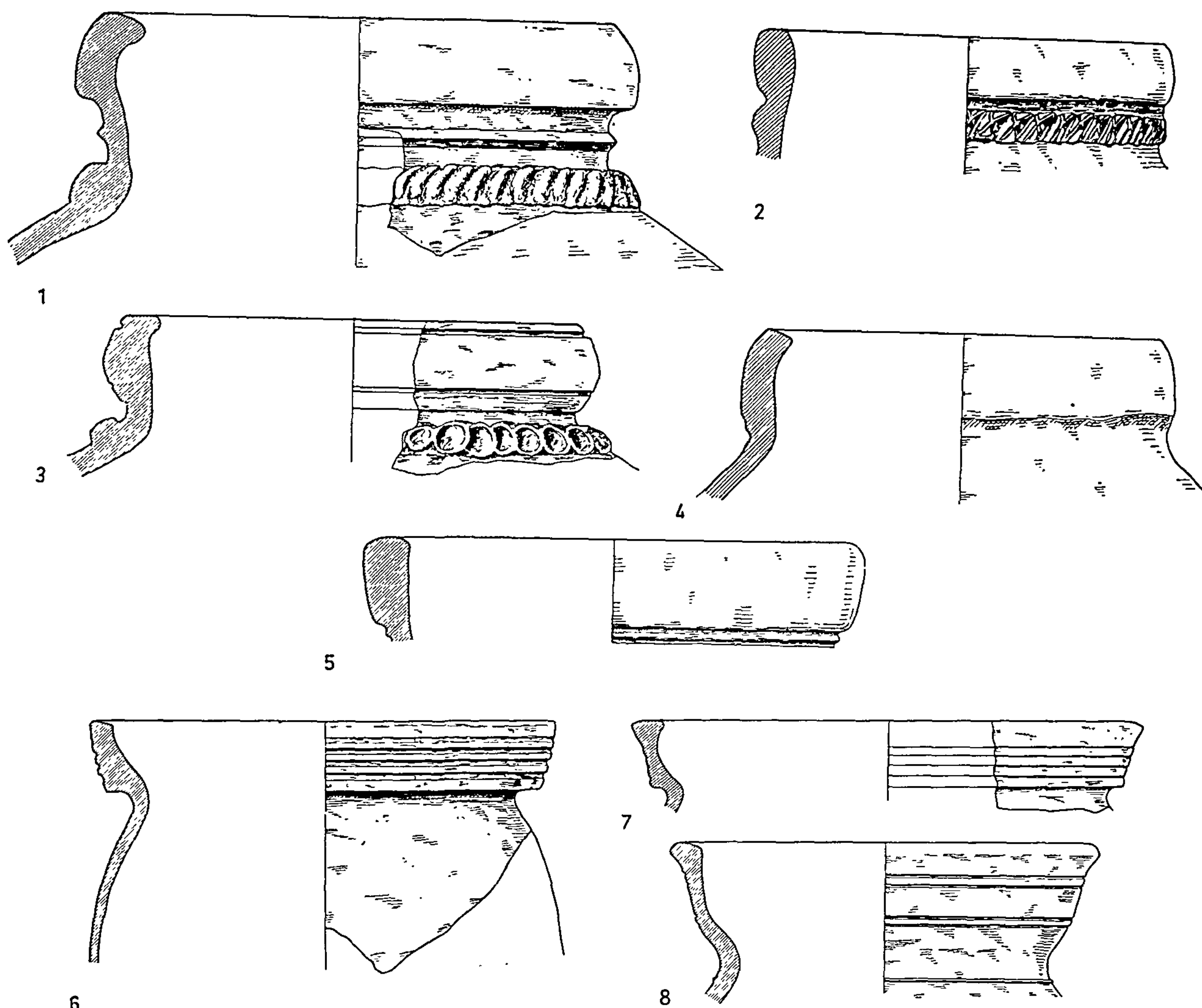


Fig. 77. 1/4. Fragments of storage jars. Type 12. Variants cf. p. 118.
1) (pl. 62:4) S; 2) (pl. 62:3) I:B14; 3) S; 4) I:A8; 5) I:B7; 6) (pl. 62:1) II:IV; 7) I:A^{v}6; 8) I:B14.

Variant 15 G, pl. 64:17, is a carinated vessel with a concave body, flattened base, short concave neck and a horizontally splayed rim which is grooved at the top.

Type 16. Small Vases and Toys.

Variant 16 A, pl. 63:1 (fig. 81:1), pl. 63:2 and 4, consist of small vases with a high shoulder, flat base and a bluntly carinated or featureless rim. The ware is coarse and pinkish in colour and the walls of the vessels bear the marks of the wheel. Specimens of this variant were found in various layers.
Variant 16 B, pl. 63:3 and 5—8. Small globular jars with a flat base and a carinated or squared rim of thickish material. The ware is of coarse quality and pinkish in colour. Examples of this variant were found in various layers.
Variant 16 C, pl. 63:10—12. Squat, carinated vessels with flat bottom, short neck and an oblique or horizontally faced rim. The ware is coarse and pinkish to dull yellow in colour.
Variant 16 D, pl. 63:9, 13—15, 17. Small, globular vessels with flat base, narrow neck and an everted, oblique or straight rim of square section. The ware is of pinkish colour and coarse texture.

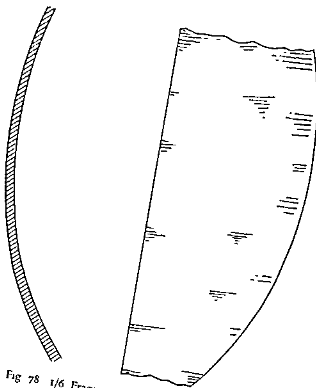


Fig 78 1/6 Fragmentary storeage jar I B11

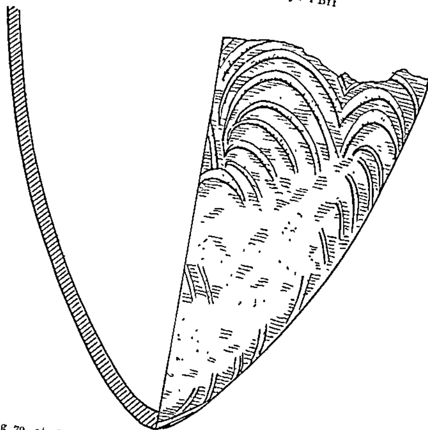


Fig 79 1/4 Pointed bottom of big jar Type 13 (pl 62 9) I A5

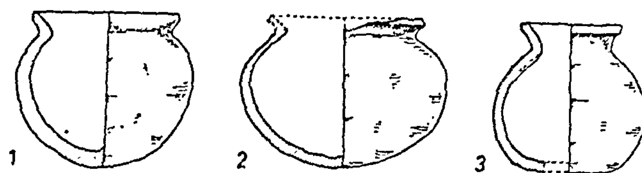


Fig. 80. 1/4. Smaller jars. Type 15. Variants cf. p. 118 f.
1—2) I:B8; 3) I:A12.

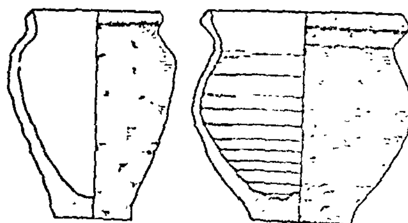


Fig. 81. 1/4. Small jars. Type 16.
1) (pl. 63:1) I:B11; 2) I:A^v 1.

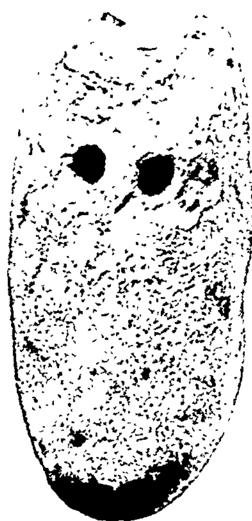


Fig. 82. 1/1. Small, clumpsy vessel (Rattle?) I:B4.

Variant 16 E, pl. 63:21. Very small vessel with a bluntly carinated body, flat base and obliquely placed narrow neck. The fabric is coarse and pinkish in colour.

Variant 16 F, pl. 63:19. Small cylindrical vessel with a thick wall and no rim. The fabric is coarse in quality and brown in colour. Fig. 82 illustrates a small vessel of somewhat the same shape, the mouth is slightly turned in. On the body two holes for suspending the vessel. Very thick fabric.

Variant 16 G, pl. 63:18. Small funnel-shaped vessel with a groove near the featureless rim. The ware is coarse in quality and brown in colour. Only one example was found.

Type 17. Jugs with Handles. Pl. 64:18 (fig. 83:2), pl. 64:19,20 (fig. 83:1).

Only three comparatively intact handled vessels were found on the site; all are of related, but distinct, forms. The bases are flat and the fabric is coarse. The grooving, resulting from turning, is visible both on the inside and the outside of each vessel.

Variant 17 A, pl. 64:18 (fig. 83:2). Tall slender vessel with slightly rounded sides and seven grooves at the neck, between the rim and the base of the handle. The rim is loosely everted and the handle is flat and ribbonlike. The fabric of the vessel is bright red in colour.

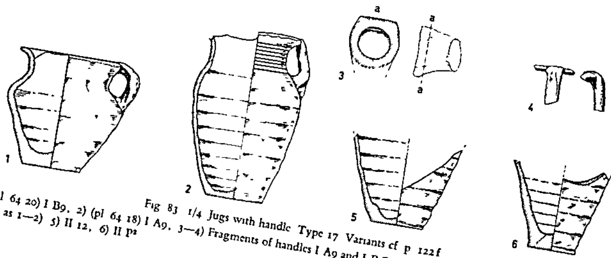


Fig 83 1/4 Jugs with handle Type 17 Variants cf p 122f
1) (pl 64 20) I B9, 2) (pl 64 18) I A9, 3—4) Fragments of handles I A9 and I B Pit 12, 5—6) Bottoms of jugs, possibly same types as 1—2) 5) II 12, 6) II P?

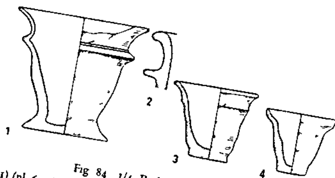


Fig 84 1/4 Beakers Type 18
1) (pl 64 3) I B Pit 14, 2) I B13, 3) (pl 64 8) I B2, 4) I B6

Variant 17 B, pl. 64 20 (fig 83.1) is more squat The wall of the vessel is curved outwards and sharply inwards to the rather short neck. The rim is similar to variant 17 A. The handle is of rectangular cross-section but curves out from the wall of the vessel. The fabric is of a dirty yellowish colour.

Variant 17 C, pl 64.19 The body of this vessel is almost oval in profile, there is no real neck and the rim is recurved. The handle is of circular cross-section and stands out from the body in a loop. The colour is a dirty yellow.

The jugs were found in trench I A 9, B 9 and B Pit 25 There are many fragments, mostly bases, which may belong to jugs of this type — and especially to variant 17 A, fig. 83 5 and 6 There are some forty specimens represented by such fragments, they are found in the lower and middle levels of trenches I and II In trench II, however, two fragments were found at higher levels

The fragment illustrated in fig 83·3 is a fragment of the top of a jug with part of the handle still attached The wall of the jug can be seen through the break in the handle at section a Other handles of jugs of unknown shape are illustrated in fig 83 4 and, some decorated examples, in pl 64 21—23.

Type 18. Beakers. Pl 64 3 (fig 84.1), pl. 64·7,8 (fig. 84.3), fig 84·2,4.

The base of these beakers is flat and specially thickened, sometimes (as in pl 64 3) forming a plate-like stand The wall rises outwards from the base and has a collar or ridge, which can be more or less prominent, below the out-turned rim. The fabric is of medium texture and is dark red-brown in colour. The example figured in pl. 64·3 is representative of a very heavy vessel of this type, which was found occasionally on the site.

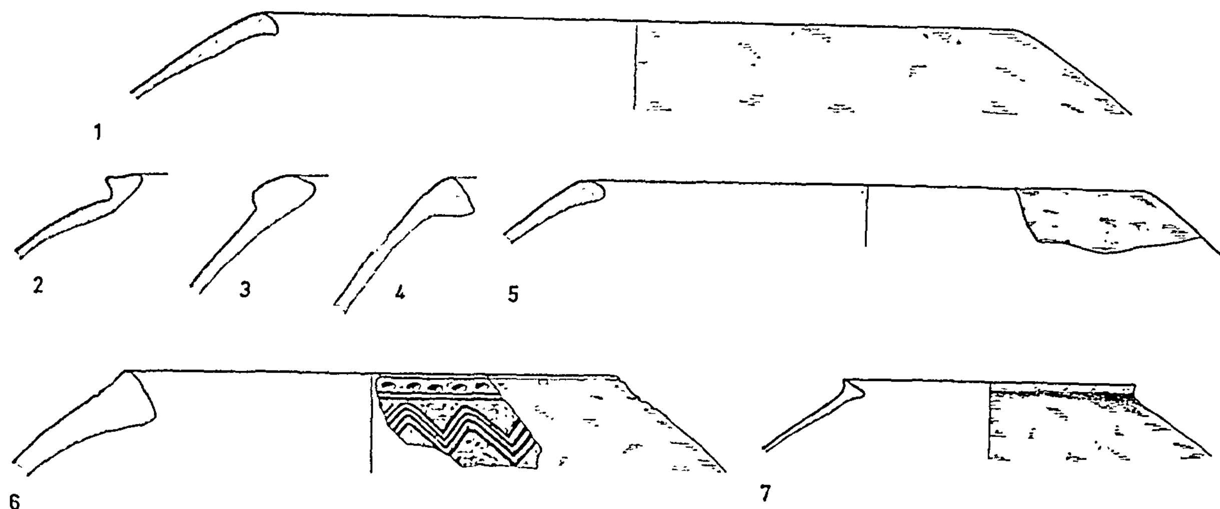


Fig. 85. 1/4. Globular bowls. Type 19.
1) I:B9; 2) I:B7; 3) I:B Pit 17; 4) I:B 12; 5) I:B10; 6) II:11C; 7) II:H8.

Type 19. Globular Bowls. Fig. 85:1—7.

The rims of these bowls are incurved and of hammer-shaped cross-section, or are internally thickened. Unfortunately only the tops survive, they must have been of great size, probably globular; the largest bowl was some 60 cms. in diameter. The decoration of another bowl, fig. 85:6, consists of a series of oval pits between two grooves, below which is a zone of four wavy lines. The fabric is thick, but of good quality and has a reddish slip both inside and outside.

Examples of this type were not found frequently: they came from the lower and middle layers of trenches I:B and II.

Type 20. Bowls of variant shapes.

Variant 20 A consists of a series of heavy, hemispherical bowls with flattened bottom. *Variant A1*, pl. 66:1, fig. 86:1—4 has an externally featureless rim with flat top. *Variant A2*, fig. 87:1—4,7,9 has gently incurved rim. The rim of *variant A3*, fig. 87:5,8,10, is thickened. The ware is usually of rather coarse quality, being sometimes rather sandy; the slip is reddish or brownish in colour. The grooves, which occur singly or in zones, a few centimeters below the lip are sometimes filled with white paint, fig. 87:4, occasionally there is a simple border made up of short, vertical, incised strokes, pl. 65:12—15. The bowls of this variant are large — the largest having a diameter of 53 cms. They occur frequently, usually in the lower levels; for instance in I:A 11 fragments of eighteen bowls of the same type were found.

Variant 20 B, fig. 87:12,13, consists of thick-walled bowls with gently splayed, horizontal rims. *Variant 20 B1*, fig. 87:14 has walls which slope straight inwards from the featureless rim. Only a few examples of this sub-variant occur. Variants 20 B—B1 were found in trench I:B 10 and B 5.

Variant 20 C, pl. 66:2 (fig. 86:8), pl. 66:3 (fig. 86:7), fig. 86:5,6, fig. 87:6. The walls of bowls of this type are often thinner than those of variant 20 A and the vessels themselves are not so large. The rim is incurved and externally elliptical-collared. The variant is sometimes decorated with incised, pl. 65:9, relief, pl. 65:7,10, or painted, pl. 65:4—6,8, patterns; it is than distinguished as var. *C1*.

The bowl illustrated in pl. 66:3 is made from a fabric of good quality; there is a pinkish slip, and inside the bowl is a painted pattern of concentric circles. The exterior of the bowl is decorated with incised grooves. Ware of a similar quality is known from other levels. The painted designs found on vessels of this variant are of a simple form, like those already observed on the cooking-pots; they consist of vertical lines, triangular leaves, arcs and plaits.

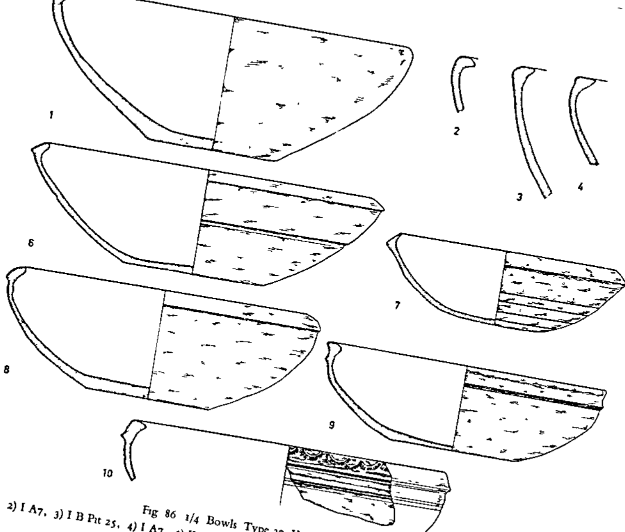


Fig 86 1/4 Bowls Type 20 Variants cf p 124, 125

1) I A6, 2) I A7, 3) I B Pit 25, 4) I A7, 5) II 12, 6) I A^{v}3, 7) (Pl 66 3) II P, 8) (Pl 66 2) A^v Pit 20), 9) II 12, 10) II 15

Vessels of variant 20 C were commonly found in the upper levels: painted examples occurred only in the topmost layers of trench II

Variant 20 D, fig. 86 9 and 10, consists of hemispherical bowls with flattened bases and hammer-shaped rims, with a ridge below the rim Their fabric is of fine quality and they have a pinkish slip The fragment illustrated in fig. 86.10 has a vertically incised pattern of almost touching arcs along the rim. The same pattern can be seen on a globular jar in Type 1B (fig 50 6)

Variant 20 E, pl. 65 1 and 2, consists of vessels with rounded profile, flat base and inturned round-collared rim The fragment represented in pl 65 2 has pairs of incised grooves below the rim The fabric of these vessels is of fine quality and there is an internal and external red slip

Variant 20 F, fig 89 1 and 2, consists of bowls with thick walls of straight, or rounded, profile with an applied band of relief ornament on the upper edge Fig 89 1 has an internally thickened rim, whilst fig. 89.2 has a rim of hammer-headed section, and grooves below the applied band The fabric is of coarse quality and is pinkish in colour The two specimens found on the site came from the lower levels of trench II.

Variant 20 F1, fig. 89 9, consists of a bowl with applied thickening of the rim

Variant 20 G, fig 89.3—8, 12, 23, consists of a series of deep bowls of somewhat angular outline They do not form a completely uniform group, but are of a simple shape with a featureless, or out-turned, rim. The fabric

Fig. 87. 1/4. Bowls. Type 20. Variants cf. p. 124.

1—4, 7, 9) var. A2; 5, 8, 10) var. A3; 6) var. C; 12—13) var. B; 14) var. B1.
1—3) I:A11; 4) I:B9; 5—6) I:A11; 7) II:12; 8) I:B10; 9) II:15; 10) I:B13; 11) I:B7; 12—13) I:B10; 14) I:B5.

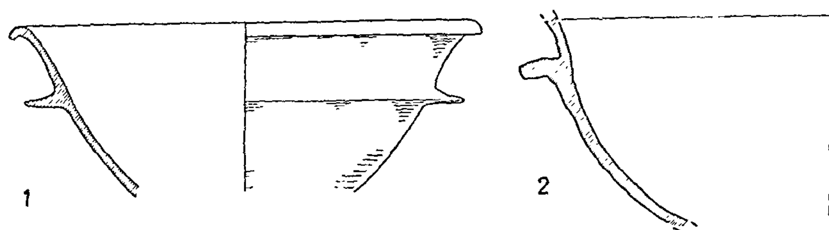


Fig. 88. 1/4. Bowls. Type 20 J.
1) (65:1) I:A13; 2) I:B14.

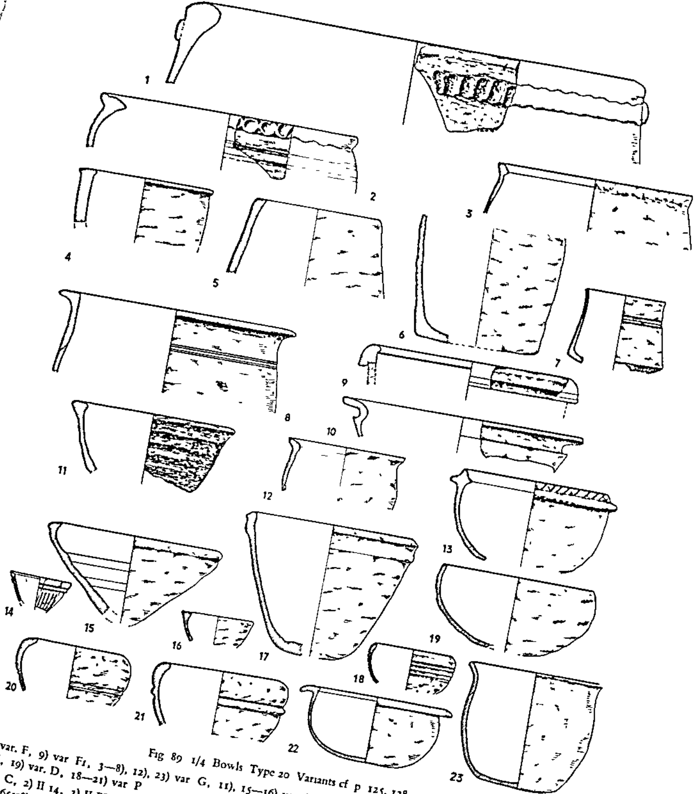


Fig 89 1/4 Bowls Type 20 Variants cf p 125, 128

1—2) var. F, 9) var F1, 3—8), 12), 23) var G, 11), 15—16) var H, 14) var H1; 10) var K, 22) var. L; 13) (pl 65:18) var N, 19) var. D, 18—21) var P
II 11 C, 2) II 14, 3) II P², 4) I B Pit 17, 5) I B5, 6) I A13, 7) I.A8, 8) I A13; 9) II.9, 10) II:1; 11) IAv7, 12) II P²;
) (pl 65:18) I B7, 14) I B5, 15) I B9, 16) I B8, 17) I B10, 18) II 1, 19) II.16², 20—21) I·B9; 22) I·A7; 23) I.Av Pit 20.

is usually of very indifferent texture. The upper part of the vessel, illustrated in fig. 89:6, is missing. Fragments of these vessels were found scattered in different layers, mostly in trench I.

Variant 20 H (fig. 89:11, 15—17) consists of bowls of a vaguely conical shape, with a pointed or blunted base and a featureless or incurved rim. This series is not completely uniform in shape and size. The fabric of most vessels is of coarse quality. A few have a horizontal, grooved ornamentation. *Variant 20 H 1* (fig. 89:14) is of fine fabric; its vertical grooving being unknown elsewhere. Bowls of variant 20 H are found in various levels of trench I.

Variant 20 I consists of bowls with broad, flat, horizontally splayed rims; the profiles are gently curved. The flat top of the rim illustrated in pl. 65:17 is decorated with a double row of short incisions. The vessels have a reddish slip, internally and externally.

Variant 20 J, pl. 64:1 (fig. 88:1), pl. 64:2, fig. 88:2. Wide, open bowls; the walls slope quickly away from an out-turned rim.

Variant 20 K, fig. 89:10 consists of a wide open bowl with splayed-out rim and a ridge below.

Variant 20 L, fig. 89:22, consists of a squat, hemispherical bowl with a broad, flat base. The out-turned rim is prominent and droops slightly. The fabric is of fine quality and the walls are thin with an applied reddish, polished slip on both the inside and the outside of the vessel. Quite a large number of this type were found.

Variant 20 M, pl. 65:20, consists of a hemispherical bowl with horizontally splayed rim. The fabric is of coarse texture and pinkish colour.

Variant 20 N, pl. 65:18 (fig. 89:13) consists of a hemispherical bowl with a collar, of rounded cross-section, below the featureless rim. The collar is notched obliquely. The fabric is of rather coarse texture.

Variant 20 O (fig. 89:19) consists of a hemispherical bowl with a featureless rim.

Variant 20 P (fig. 89:18, 20, 21) consists of hemispherical bowls with inturned rim and grooves on the outside. The fabric is of good quality and is reddish in colour.

Variant 20 Q, pl. 65:19 (fig. 90:1), fig. 90:2—5, is shaped as the frustum of a cone with a steady flat base and a rim which is either featureless or everted. The fabric is usually coarse in texture. The vessel illustrated in pl. 65:19 has a dark red slip and is decorated, externally, with a series of spaced-out grooves.

Variant 20 R, pl. 67:1 (fig. 91:6), pl. 67:2—4 (fig. 91:1), pl. 67:5 (fig. 91:3), pl. 67:6 (fig. 91:2), fig. 91:4, 5, consists of a series of flower-pot-shaped bowls with hammer-shaped rims with horizontal lip. The walls are straight or slightly curved, in profile they are shaped like the inverted frustum of a cone. Most of the vessels have a hole in the base and they are said to have served as supports which would circulate air in piles of vessels awaiting firing. The fabric is of coarse quality and the marks of the wheel are very noticeable both inside and outside the vessels. Many examples of this variant are found, especially in the middle and lower levels of trench I.

Variant 20 S, pl. 64:9, 10 (fig. 91:7), pl. 64:11, consists of small low bowls, or cups, with a horizontally everted rim, a low carination and a somewhat rounded base. A number of examples are found in the middle and lower levels of trench I. *Variant 20 S1* is similar to the main variant save that it has no carination, pl. 64:12.

Variant 20 T, pl. 64:14, consists of a small bowl, or cup, with a carinated body and a featureless rim.

Variant 20 U, pl. 64:4, 13, consists of small bowls, or cups, with straight, or slightly incurved, walls with grooved body.

Variant 20 V, pl. 65:16, consists of a small fragment of a bowl of unknown shape with a billet, possibly in the shape of a bird's head, on the flat featureless lip.

Variant 20 X, fig. 92, consists of a fragment of a carinated bowl of a black, unpolished fabric. Above the carination is a zone of grooves and wavy lines in low relief. The shape of the rim is unknown. The variant is found in the uppermost levels of trench II and is completely foreign to the general type of Rang Mahal pottery.

Type 21. Conical Bowls with Incurved Rim. Pl. 67:7, 8 (fig. 93:6), fig. 93:1—5, 7—9.

There are a number of small variations in the form of this type of vessel. The rim can be more angularly turned pl. 67:7, or more gently incurved, fig. 93:8. The wall can be straight, slanting inwards from top to bottom, fig. 93:4, or can have a gentle curve in its profile, as in the vessel represented in fig. 93:9 which has a splayed base (cf. also fig. 93:5, 7, 8). The thickness of the wall varies from example to example; fig. 93:1—3 illustrates some

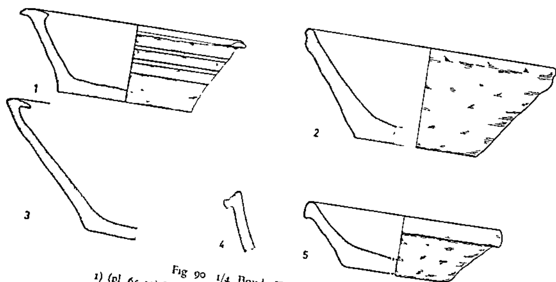


Fig 90 1/4 Bowls Type 20 Q
1) (pl 65 19) I B Pit 17, 2) I B8, 3) I B5, 4) I A3, 5) I B2

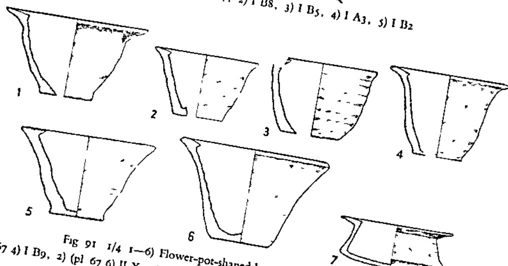


Fig 91 1/4 1—6) Flower-pot-shaped bowls 7) carinated bowl
1) (pl 67 4) I B9, 2) (pl 67 6) II X, 3) (pl 67 5) I B9, 4) I B7, 5) I B6, 6) (pl 53 1) I A13, 7) I A 13

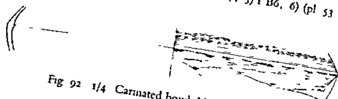


Fig 92 1/4 Carinated bowl, black ware II 1

very heavy bowls, while fig 93 8 illustrates a vessel with thin walls All the specimens are carelessly thrown and are often warped. Fragments and complete examples of many thousands of these bowls were found in the two trenches; but despite their frequency no reliable typology or chronology could be constructed for their type. The heavier bowls are not found in the upper levels; the lighter vessels, however, are found at all levels

Type 22. Dishes and Small Plates Fig 94, pl. 63:20, 22—24.

Variant 22 A, fig 94:1, consists of a dish, or low bowl, which suggests, both in its shape and colour, the Northern Black Polished Ware The two fragments (found in I· Av 7) have a well polished slip.

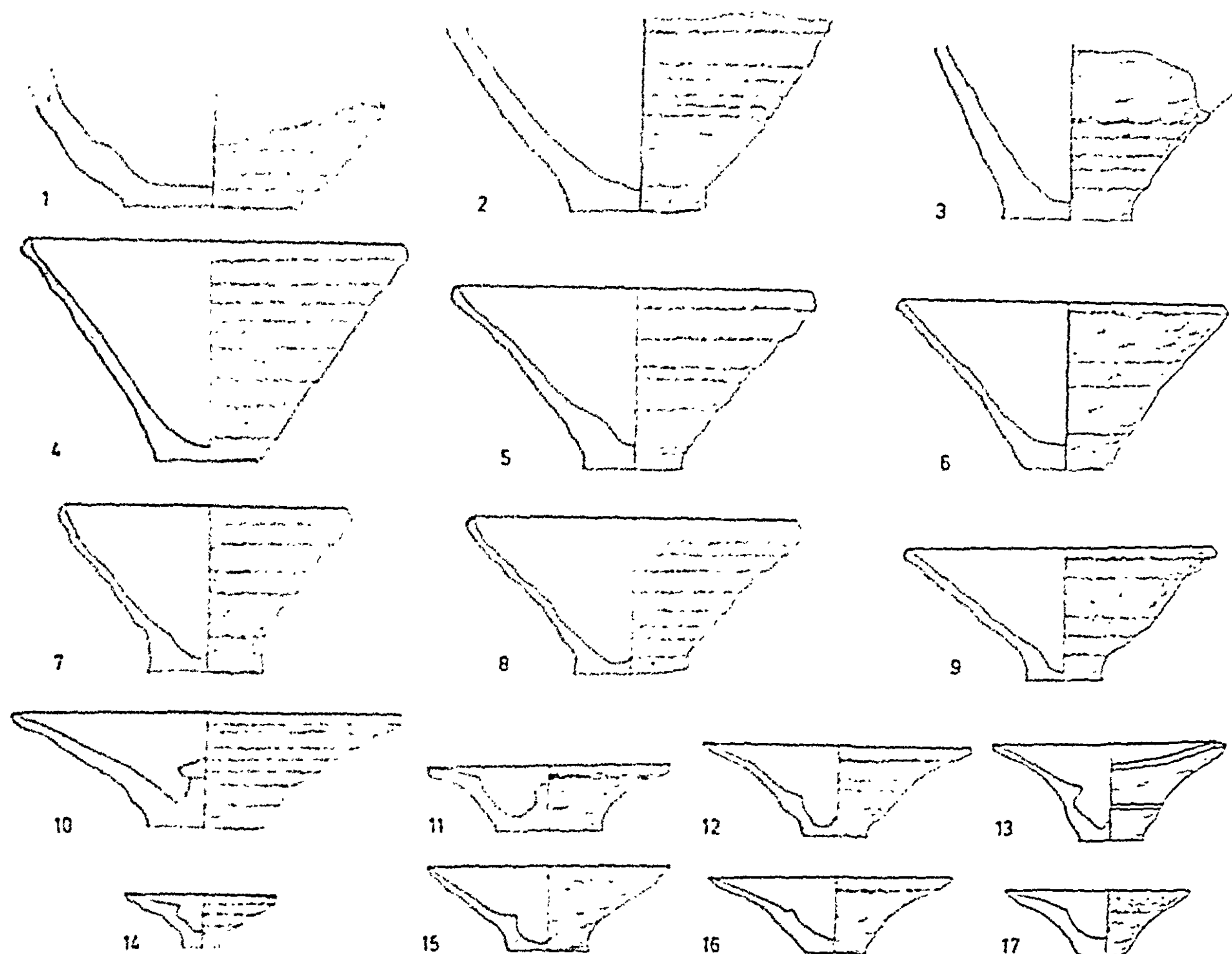


Fig. 93. 1/4. 1—9) Conical bowls. Type 21. 10—17) conical lids. Type 24 A. 11) var. 1. 13—15) var. 2. 16—17) var. 3. 1) II:16², 2) I:A9; 3) II:13; 4) I:A10; 5) I:A5; 6) (pl. 67:8) I: B Pit 17; 7) I:A^v 8; 8) I:B Pit 25; 9) I:8 Pit 14; 10) (pl. 67:9) II:H5²; 11) (pl. 67:10) I:A13; 12) I:A3; 13) II:P²; 14) II:H4²; 15) I:A5; 16) I:B7; 17) (pl. 67:11) IA^v5.

Variant 22 B, fig. 94:2 consists of a dish with straight sides and knife-edge rim. Low down is a blunted carination which is presumably the turn of the base. The fabric is grey in colour and of fine quality with a smooth surface. It was found in trench I: B 2.

Variant 22 C, pl. 65:3, fig. 94:3, 4, 10, comprises dishes with rounded profile, flat base and inturned round-collared rim. The fabric is of fine quality with a reddish, smooth slip.

Variant 22 D, fig. 94:7—9, comprises dishes with flat bases and hammer-shaped, or out-turned, rims. The sides are upright or slope outwards from the base. The example illustrated in fig. 94:8 has traces of black painting on the rim, on a reddish slip. One example, fig. 94:9, is yellow-grey, partially black, in colour.

Variant 22 E, fig. 94:11, 12, comprises crudely formed dishes with flat bases and upright walls, springing at a right angle from the base. The rim is featureless. The fabric is of coarse quality and there are traces of a red slip.

Variant 22 F, fig. 94:6, comprises crudely formed dishes with flat bases and upright walls, set at a right angle to the base. Inside, the wall curves convexly from top to bottom. The fabric is very coarse and there is a trace of red slip.

Variant 22 G, fig. 94:13—15, comprises small plates of somewhat conical shape. The example shown in fig. 94:13 has a flat, splayed base, walls of rounded profile and a markedly incurved rim. From the narrow bases of the examples illustrated in fig. 94:14 and 15 the walls rise outwards to a featureless rim, the latter represents a type

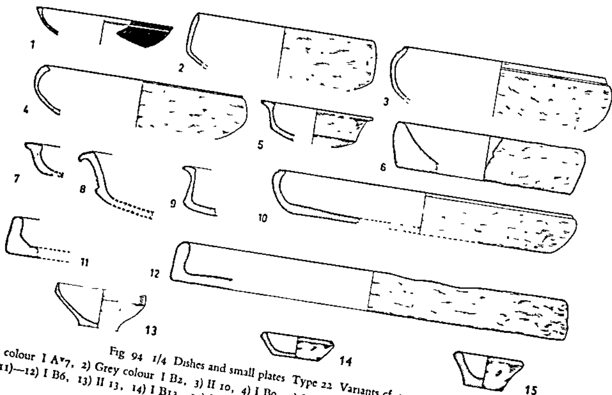


Fig 94 1/4 Dishes and small plates Type 22 Variants cf p 129 f
1) Black colour I A▾7, 2) Grey colour I B2, 3) II 10, 4) I B9, 5) I B8, 6) I B Pit 25, 7) II 15; 8) II:IV, 9) I A6, 10) I.B Pit 25, 11)—12) I B6, 13) II 13, 14) I B13, 15) I A12

of heavy, coarse fabric. The plates of this variant vary greatly in quality and size. About twenty-five examples were found at various levels in both trenches — but they were mostly found in the middle and lower levels. Some have certainly been used as lamps — as witness the sooty mark of the wick which remains on certain examples.

Variant 22 H, pl 63 20, consists of a small, shapeless, crude plate found in I:B 1.

Variant 22 I, pl 63:16 and pl 82 51, is represented by a single small dish or plate with flattened base and vertical sides, it has a somewhat concave profile and a featureless rim The diameter at the lip is 7,8 cms. The fabric is very thin and fine and it has a dark-red slip Painted on the base, a design of four buds surrounds two concentric circles and is, in turn, bordered by two more concentric circles On the inside wall are three groups of vertical strokes. When found there were a series of black strokes between the white ones, but these have since disappeared. This unique vessel was found in I B 12

Variant 22 J, pl 63·24, is a squat small dish or plate with flattened base and a heavy hammer-head rim [illegible] slightly inwards The outer edge of the rim has a series of small, oblique incisions. There are two concentric grooves inscribed on the base The fragment was found in I A 14.

Variant 22 K, pl 63 23, is probably the fragment of a small plate with an internal decoration of [illegible] and relief patterns

Variant 22 L, pl. 63.22, is probably the fragment of a small plate with an irregular, incised pattern [illegible]

Type 23. Basin Fig 95

This is a very large basin with somewhat concave, outward sloping, walls. The [illegible] the base was probably flat Diameter at mouth: 52 cm.

Type 24 Lids.

Variant 24 A1, pl. 67 9 (fig 92 10) consists of lids with inwardly sloping sides [illegible] as a handle.

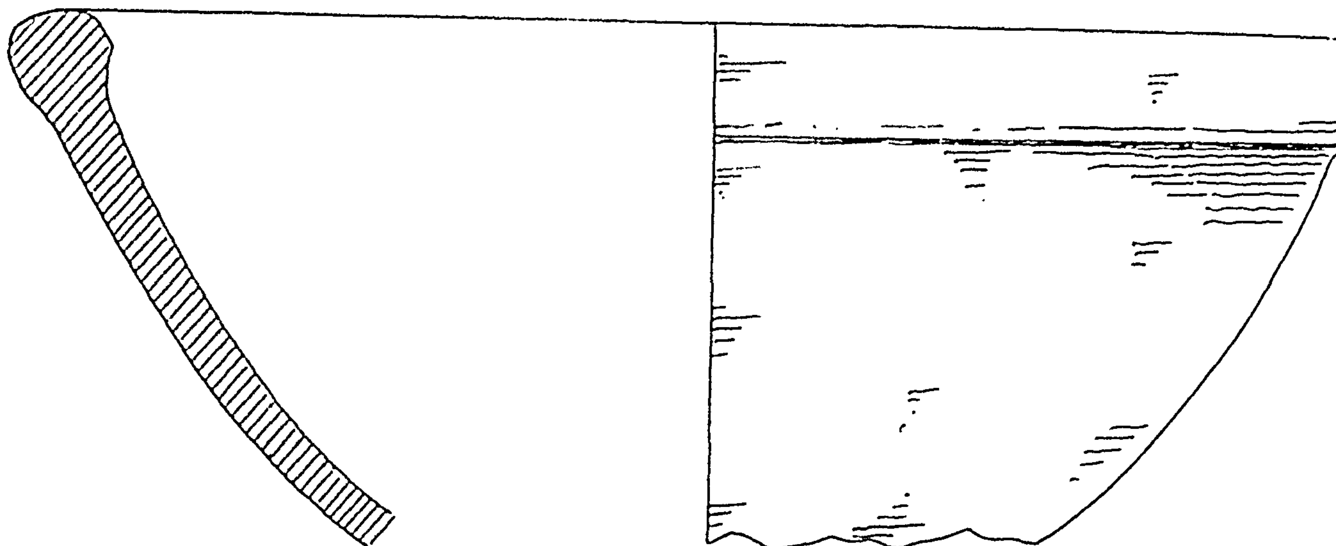


Fig. 95. 1/3. Basin. I:B10.

Variant 24 A2, pl. 67:10 (fig. 92:11), fig. 92:13—15, has a dished rim and hemispherical central depression which contains a knob, which sometimes is very small.

Variant 24 A3, pl. 67:11 (fig. 92:17), fig. 92:16. Similar to 24 A2 save that there is no knob.

Many of the examples of these three sub-variants have a groove round the upper edge of the lip.

The lids vary in size between 6 cms. and 20 cms. in diameter. The knobs also vary in size up to that of the exaggerated knob of pl. 67:12. The three types were found at all levels of the trenches.

Variant 24 B, pl. 67:13, 14, represents a rare group of objects which were in all probability lids. They cannot, owing to the pierced holes in the walls, be the bases of vessels of the type illustrated in pl. 62:8 despite their close similarity in form.

Type 25. Stands. Fig. 96.

About fifteen examples, most of them of uncertain use (base, pedestal or stand), were found on the site.

Fig. 96:1 has certainly been a jar-stand. The shallow disc on the hollow stem has obviously had a similar disc at a base on the other side of the stem.

The examples illustrated in fig. 96:2 and 3 are not unlike the bases of the pedestals of the clothmaker's or potter's moulds or stamps (pl. 70:4b), but fig. 96:2 is too large and fig. 96:3 too small. Fig. 96:2 is a heavy ware with a dark-red slip. Fig. 96:3 and 4 represent a medium ware of somewhat sandy texture, one with a dark-red slip, the other with a red-brown slip. Fig. 96:1 is of fine fabric with a red slip.

Type 26. Lamps. Figs. 97 and 98.

Variant 26 A, fig. 97:1 and 2, consists of small lamps with a lip. The ware is coarse and pinkish in colour — often showing traces of soot. They vary in size between 7 and 11 cms. in diameter at the mouth.

Some twenty-five examples were represented on the site and were found at all depths in both trenches.

Variant 26 B, fig. 97:3, is of similar shape to 26 A but it has a cylindrical pedestal, which is about 10 cms. high. The pedestal is grooved and broadens slightly towards the flat base.

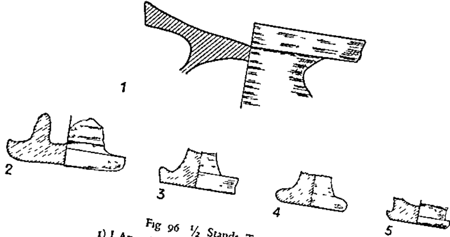


Fig 96 ½ Stands Type 25.
1) I A7, 2) II H4, 3) I.A11, 4) I.B5, 5) I B5

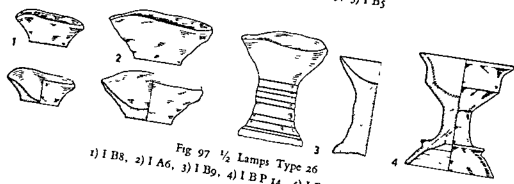


Fig 97 ½ Lamps Type 26
1) I B8, 2) I A6, 3) I B9, 4) I B P 14, 5) I B 13, 6) I A12



Fig 98 ½ Lamp(?) I B6

Variant 26 C, fig. 97 4, is an other type of lamp which has a carinated bowl, with a gently everted rim, on a cylindrical pedestal of slightly concave profile There is a prominent ridge near the foot of the pedestal and from this point the foot is splayed outwards

Variant 26 D. The fragment illustrated in fig 98 may possibly have been used as a lamp.

Certain small dishes of type 22, variant G, may have served as lamps.

Type 27 Incense Burners. Pl. 68

The incense burners take the shape of a pedestalled bowl with a handle. About twenty-five examples, fragmentary and otherwise, were found at various levels throughout the two trenches.

Variant 27 A, pl 68 9, 11, is a small, undecorated, shallow bowl with rounded profile and horizontally incurved, flat rim The bowl of the example illustrated in pl. 68 9 is grooved, the bowl rests on a pedestal whose slightly

concave sides expand towards the flat base. In the example illustrated on pl. 68:9 the pedestal is hollow. The handle is ribbon-like and forms a large loop. *Variant 27 A1* is illustrated in pl. 68:10, where the rim of the bowl is featureless and the pedestal cylindrical with a splayed foot. *Variant 27 A2*, pl. 68:7, consists of a funnel-shaped bowl with a featureless rim. The stem, which has a collar of rounded section, expands quickly to a flat base of roughly the same diameter as the mouth.
Variant 27 B, pl. 68:6. The bowl is of the same type as variant 27 A and the pedestal is hollow. A rectangular extension runs from the base to join the bottom of the handle, which is decorated with two lines of short incisions.
Variant 27 C, pl. 68:5 and 8, is of the same general type as variant 27 B save that the rim is decorated with a series of small, applied buds. The handle is grooved and has a slow S-shaped profile. The pedestal is solid and the fabric coarse. *Variant 27 C1*, pl. 68:1, has a bowl similar to the main variant type, but the relief feature forms a collar to the otherwise featureless rim. A small collar, of rounded cross-section, appears at the top of the pedestal. The handle is plaited and bears at the top of the loop a modelled "nandi". The fabric is of a better quality than the other vessels of this type and is of a bright pink colour.

Type 28. Perforated Pottery.

Perforated pottery occurs rarely at Rang Mahal. Three different types of vessel can be distinguished among the eight examples found.
Variant 28 A 1, fig. 99:1, is a small pot, possibly of globular shape, with gently splayed oblique rim. The perforations are small and the fabric is of reasonably good quality, it has a red slip.
Variant 28 B, fig. 99:2, is a bowl with an everted rim with a flattened top. The sides bulge slightly. Some two centimeters below the rim is a ridge below which the body of the vessel is perforated with a series of medium-sized holes. The fabric is of reasonably good quality and is adorned with a red slip.
Variant 28 C, fig. 99:3, is a bowl with a horizontally everted rim with a flat top. The sides are straight and slope outwards. The perforation starts some two centimeters below the rim, the holes being of medium size. The fabric is of a coarser quality than that of variants A and B, it is red in colour. This pottery is presumably used as incense burners.

Type 29. Moulded Pottery.

Variant 29 A, pl. 69:1 (fig. 100:1), represents a shallow bowl with horizontally out-turned rim. The sides bulge gently towards what must have been a flattened base. The surface is ornamented with horizontal bands of relief decoration. Below the rim are two narrow ridges and below this a panel containing a row of double-hook-shaped motifs. Below this is a band of ornament made up of a series of short upright lines. Towards the base is a band of rosettes. The surface of the fabric is rough and there are traces of a brownish slip.
Variant 29 A 1, pl. 69:7. Two fragments of the belly of a bowl with horizontal decoration. The decoration consists of two black painted lines flanked by a beaded, or dotted, line in relief. Above this border is a row of rosettes interrupted, ever so often, by a complicated circular pattern of unidentifiable form.
Variant 29 A 2, pl. 69:3 (fig. 100:2). Fragment of a small bowl which is decorated below the lip with two horizontal bands of small dots below which there was probably a band of swastikas.
Variant 29 B. This type consists of small shallow, almost half spherical, bowls with featureless or pointed rim. All are of a very thin, fine fabric covered with a red slip and all are differently ornamented:
Variant 29 B 1, pl. 69:2 and 10 (fig. 100:6). This variant has a plain, internally thickened rim. The base is delineated by a deep groove surrounded by a band of relief dots (this is encircled by another groove in pl. 69:10). The sides of the bowls are decorated by a series of vertical relief strokes topped by a series of large dots. In the fragment illustrated in pl. 69:2 the dots at the base are separated by these vertical bands.
Variant 29 B 2, pl. 69:6 (fig. 100:5). The bowl is decorated with two horizontal zones of rosettes, the upper zone flanked by plain bands.
Variant 29 B 3, pl. 69:11. This fragment which, judging by other finds, came from a bowl of the same shape as the above, is decorated horizontally with zones of lotus buds. Each zone is separated from the next by a row of small dots. The small fragment illustrated in pl. 69:8 has a pattern of simplified rosettes and buds.

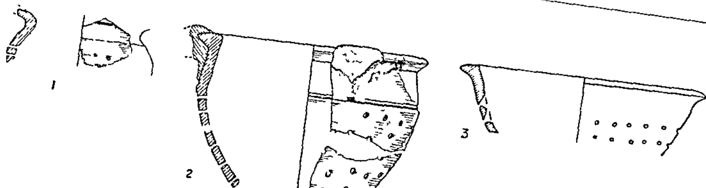


Fig 99 1/1 Perforated pottery Type 28, Variants cf. p 134
1) I A9; 2) I A7, 3) I B9.

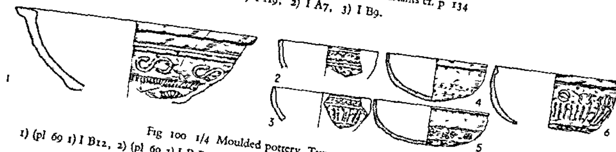


Fig 100 1/4 Moulded pottery Type 29 Variants cf p 134 f
1) (pl 69 1) I B12, 2) (pl 69 3) I B Pit 18, 3) (pl 69 5) II 1, 4) (pl 69 4) II 1, 5) (pl 69 6) II 1, 6) (pl 69 10) S

Variant 29 C, pl. 69:9 (fig 100 4), is a bowl of the same form as that described above but is decorated all over with a series of small dots The fabric is thin and fine but there is an inmixture of small grains and sand

Variant 29 D, pl 69.5 (fig 100 3) This fragment represents a small bowl decorated with a series of vertical bands of dots and small billets, below a horizontal row of dots

Variant 29 E, pl. 69.4 This variant is represented by a fragment from a bowl of the same shape as those described above. The fabric is however thick and heavy with a thickened base; it has a brownish-red slip, blending to grey at the broken rim. Below the zig-zag line under the rim the surface is partly cut away The decoration consists of double rows of vertical, notched lines, having the appearance of comb impressions, on either side of a zone composed of a vertical line of double, concentric circles. This composition is flanked on either side by pairs of vertical grooves

Variant 29 F, pl 69 13 This variant is represented by a fragment of a spouted bottle of the same character as Type 4 H. It is further related to this type by the internal grooving at the joint of the neck The decoration consists of vertical rows of dots separated by cordons At the neck the surface of the vessel is plain, save for a plain encircling black painted band. The decoration is carelessly executed and the fabric, which is mixed with a micaceous powder, is not so fine as that of variants A—D. There is a red slip on both the inside and the outside Another fragment of a much heavier ware has the same dotted decoration over the whole surface but no plain dividing lines Pl 69:12

Variant 29 G, pl. 69:14 This variant consists of a fragment of a spouted jar; the spout, which has a pouch-like bulge at its lowest point, is uncomplete On the same level as the spout is a broad band of relief ornament depicting a lotus pattern, the details of which are difficult to distinguish The fabric is of poor quality and porous; it has a black slip.

The fragment of a mould illustrated in pl. 69·16 was made for a rather large bowl. The negative decoration consists of horizontal rows of small rosettes, beneath which are alternating rows of small rosettes, under which again are alternating rows of rosettes and lotus buds.

The moulded pottery comes mainly from the topmost levels of the trenches, and especially from trench II. Variant 29 A, pl. 69.15, comes from a lower level (I·B 12). The spouted bottle of variant 29 F comes from I·A 5

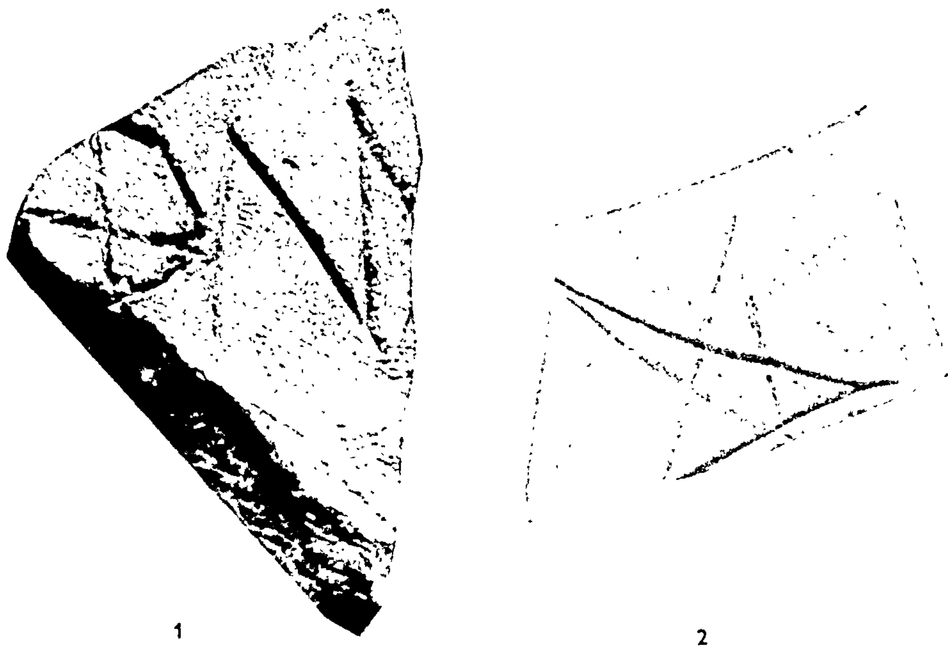


Fig. 101. 1/1. Fragment of pottery with incised marks.
1) I:B13; 2) I:B Pit 18.

and one of the two fragments of this type found in I:A 6 belongs to the same bottle. One fragment of the same type was found in I:B 4, another in I:B 5 and another in I:B 8.

Unidentifiable Pottery Fragments.

Pl. 82:54. A small fragment of grey/grey-blue pottery cannot be related to any other fragment from the Rang Mahal excavations. It is horizontally striped, each alternate stripe being darker and slightly below surface level. The fragment is burnished and internally the ware is coarse and grey. It was found in trench II:1.
Pl. 82:53. Another unique type shows a piece of grey pottery with a border of grooves, I:A8. A very small piece of the same kind of pottery was found in I:Av6.

Marks on Pottery.

The flask-shaped pot, pl. 43:1 has a nicely inscribed mark. Fig. 101 shows two pot-fragments with different marks. Perhaps in all the three cases we have the potmakers trade-marks.

Glazed Pottery.

Pl. 82:59. Small fragment of pottery with external turquoise blue glaze and internal brown glaze. The fabric is brownish-red in colour. The fragment was found in I:B10 below the northern part of wall N (p. 73), a layer probably dated to the period about 300 A.D.
Pl. 82:56. Fragment of an undecorated bracelet of bluish-green glazed pottery. The glaze is very thin and covers the whole object. A fragment of a bracelet of bluish-green glazed pottery with longitudinal grooves was found in A10.
Pl. 82:57. Fragment of a bracelet of green glazed pottery decorated with slightly slanting incised lines.
Pl. 82:58. Fragment of a bracelet of green glazed pottery. It is decorated with a longitudinal band consisting of two parallel grooves on either side of oblique strokes. The green glaze is nearly worn away but it can be seen in the grooves. It was found in I:B10.

Trench I		1A	1B	2	3	4	4B	5	9	10A	10B	12	1
A	S	x	x										
	1		xxx	x		x	x	x'		x'	x'		
	2	x	x'				x'	x		xx	x'		x
	3	x'	xxx		x			x		xx	x'	x	
	4	x'	x'			x'		x'		xx	x		
	5	xx	xxx	x		xx	x	xx	x'	xx	x	x'	
	6	xx	xxx	x	x	x		x'	x	x			
	7	xx	xxx			xx	x	xx	x'	xx	x	x	
	8	xx	x'			xx	x'	xxx	x'	xx		x	
	9	xx	xxx	x'		xx	x'	xx	xx	x'		x	
	10	xxx	xxx	x'		xx	x	xx	xxx	xx	x	x	
	11	xx	xx			xxx	x	xxx	xxx	xx			
	12	xx	xxx			x		xx	x'	xx	x'	x	x
	13	x'	xx		x	x		xx	x	x'			
	14	xx	xxx			x		xx	x'	x'	x		
Av	S	x	x'				x	x					
	1	x	x'		x			x		x	x		x
	2		x'			x'				x'	x		
	3	xx	xxx		x	x'	x'	x	x'	xx	x		
	4	xx	xxx			x'		x'		x			x
	5	xx	xx			xx		x'	x'				
	6	xx	xxx		x'	x'	x	x'	x'	xx			
	7	xx	x			xx		x	x	xx			
	8	xx	xx			x				xx			
A Pit	3	x'	x'			x'							
	9	x	xx	x		x'				x'	x		
	10	xx	xxx	x'		x				xx	x'		
	12	x	xx										
	21	xx	xxx			x			x	x			
	27	xx	x'							xx			
Av Pit	20	xxx	xxx	x	x'	xx				xxx	xxx		
B	1		x'			x'				x'	x		
	2	xx	xxx	x'	x'	xx	x	x'		xxx	x'		
	3												
	4	xx	xxx			xxx				xxx	x'		
	5	xxx	xxx	x	x'	xxx	x	x	x'	xxx	xx	x	
	6	xxx	xxx	x'		xxx		x'	x	xxx	x'		
	7	xxx	xxx	x		xxx			x'	xx	x	x	
	8	xxx	xxx		x'	xx	x	x	xxx	xxx	x	x'	x
	9	xxx	xxx	x		xxx	x	x	xxx	xxx	x	x'	
	10	xx	x'			xxx	x		xx	xxx			
	11	xx	xx			xx	x		xx	xx		x'	
	12	xx	xx			xx	x	x	xx	x		x'	
	13	xx	xx		x'	x'		x	x'	xx		x'	
	14	xxx	xxx			xx	x	x	xx	xx	x'	x	
B Pit	14	xx	xxx		x'	xx	x	x		xxx	xx		
	15	xx	x'							x'	x		
	17	xx	xxx		x	xx	x'	x'	x	xxx	xx	x'	
	18	xx	xxx			xx	x	x'		xx	x'		
	22	x	xx			x	x	x	x	xx	x		
	24	xx	x'			xx	x	x	x'	xx			
	25	xxx	xxx			xx	x'	x'	x	xx		x'	
	26	xx	x'			x		x'	x'	x'			
	27	xx	x'			xx		x	x	x			

To the left the different layers of trench I (cf p. 66f), concerning the Typ
x' more than one, but less than 5; xx means from 5 to 9 and xxx 10 or more

which occur on the Rang Mahal vessel illustrated in pl. 39:1 have an affinity to those on pottery from Sirkap (fig. 15:XXVIII), which is however dated to the pre-structural period (i.e. before Phase I). The large triangles on the Sirkap vessel illustrated fig. 15:XXXI (Phase III, i.e. second half of the first century A.D.) have a counterpart at Rang Mahal (e.g. pl. 39:7). Two sherds from Sirkap have small painted birds of a style much inferior to that which occurs on the Rang Mahal pottery. One fragment (*Taxila* fig. 15:XXIV) may possibly be compared to our fragment pl. 37:4; but the pattern is unclear. These three fragments from Sirkap are dated to about the time of the Birth of Christ (between phases I and II).

D. H. Gordon[1] points out that painted pottery exists "in considerable quantities in the district of Peshawar, Mardan, Rawalpindi, Lahore and Montgomery, on many sites definitely of the early historic and possibly of the mediæval periods, and where painted pottery is produced today". He figures patterns we recognize from Rang Mahal with crosshatching, triangles, chessboard-patterns, and especially "the tapered rim ornament", as for instance on a dish from Lahore (his pl. V:g) and various other pots which are comparable to our pl. 56:1, 59:3.[2]

Some fragments of definite Rang Mahal type were found at Hastinapura in levels ascribed to period IV[3] (i.e. 2nd century B.C.-late 3rd century A.D.). The vessel illustrated in Lal's fig. 22 (late period IV) is, in both form and decoration, a distinct parallel to certain Rang Mahal vessels (eg. fig. 55:1 (pl. 27:1)).

The first reaction of the archaeologist on seeing the Rang Mahal painted pottery is to compare it with the Mohenjo-Daro/Harappa painted pottery[4] and to wonder whether there is a continuous tradition between the two. There are certain similarities. The hatching of the plants on such vessels as Marshall, *Mohenjo-Daro*, III, pl. LXXXVII:5 can be compared with the hatching of the bird's wings on Rang Mahal pl. 36:2. The cross-hatched horizontal borders of the same vessel compare well with the vertical borders of Rang Mahal pl. 34:8. The hatching of Rang Mahal fig. 57:2 can be compared with that on the Mohenjo-Daro vessel illustrated by Marshall, *ibid.* pl. LXXXVII:6. The unusual pattern on the vessel depicted in pl. 35:7 bear a certain resemblance to Marshall, *ibid.* pl. LXXXVII:4. The chequer pattern is rare at Rang Mahal but does occur on the vessel illustrated in pl. 39:3, it also occurs at Mohenjo-Daro (Marshall, *ibid.* pl. XCII:13) and at Harappa (Vats, *Harappa*, pl. LXVIII:64). Other parallels between Rang Mahal and Harappa are certain stereotyped flowers, our pl. 33:1, 34:3, Vats pl. LXV:25—35, (occurring in the latest period at Harappa, *ibid.*, I, p. 235). Our pl. 33:3 is suggestive of the pipal-leaf pattern, illustrated by Wheeler, Harappa 1946, pl. XLVI:6 (Wheeler's type R37: VII b *ibid.* p. 107). Certain types of bird motifs could b[illegible] ed, for inst[illegible] e the "jumping birds" (Rang Mahal pl. 36:3 and pl. 18:2 and Vats, *Hara*[illegible] I:3, 6[illegible] is interesting to note here the cross-hatched bodies of our pl. 18:2 a[illegible] pl. [illegible] e quoted Harappa birds are peacocks (cf. Rang Mahal pl. 37:1). A[illegible] rity [illegible] designs which divide

[1] Gordon, *Painted pottery*.

[2] One can note the occurrence as far south as Vadna[illegible] (north of Gujarat) and a[illegible] ri (on the northern coast [illegible] Saurashtra) of "a paint[illegible] th black designs on a re[illegible] slipped ware of coarse[illegible] tion with red polishe[illegible] ware. The published f[illegible] ottery are very smal[illegible] and the patterns are [illegible] te. "The designs consist mostly of linear [illegible] oop" (Subbarao [illegible] ta, [illegible] 34, [illegible] als [illegible] ara [illegible] est [illegible] t [illegible]

[illegible] pl. 11, 12:14—[illegible] 23, [illegible] ber of plant [illegible] f [illegible] and 16 and [illegible] that the e[illegible] ng revival [illegible] Gujarat an[illegible]

animals or flowers (Rang Mahal, pl. 18.2 and Vats, *ibid.*, pl. LXII:8, 11, 12 and 15). It is easy to reject the theory of such a continuity of tradition. The differences between the pottery of the two cultures are striking, in fabric, shape and painted designs. Further, the period of time which separates Rang Mahal and Mohenjo-Daro is considerable. On the other hand, tenuous link between the tradition of painting on the Mohenjo-Daro/Harappa pottery and the Rang Mahal ware would not, chronologically speaking, be impossible in the light of the obvious connection between the ancient Rang Mahal pottery and the strong painted pottery tradition of today, known in the Rang Mahal area.[1]

Sharma[2], who mentions the resemblence between the Rang Mahal and Harappa motifs concludes: "for all we know at present" the Rang Mahal designs "may be a regional product with little dispersal outside Rajputana". Although it appears certain that the painted pottery from Rang Mahal, in its more developed form at least, belongs to a very restricted area, it is nevertheless to be noticed that some of the closest parallels come from the Surkh-dherai, Chicha-dherai and Chaudhwan mounds in Waziristan, the north-western frontier province of Pakistan (north of Baluchistan). The pottery was collected by Sir Aurel Stein who said that he had not found similar pottery on other sites which "can definitely be assigned to the later Indo-Scythian period of our era ... On the other hand these painted fragments in their colour treatment and in certain geometrical patterns, such as the hachures, lattice work, leaf shapes, show a well marked affinity to painted pottery of chalcolithic times recovered from a series of prehistoric sites in Baluchistan".[3] Aurel Stein, who is well aware of the chronological gap between the two cultures, hints especially at resemblences between certain pottery with incised and relief decoration found here and pottery found at certain sites at Sistan, which he assigns approximately to "the historic period just preceding Sasanian rule". He is therefore rather inclined to date these sites to a phase between the prehistoric and early historic periods.[4]

Here we must note the striking resemblence between the Surkh-dherai pottery and the Rang Mahal material: cf the common pattern pl. 27:1 with Stein, *Waziristan*, pl. I:SD39; our pl. 39·6 (and others) with *Waziristan*, pl. I·SD31; our pl. 29:2 with *Waziristan*, pl. I:SD40; our pl. 37:5 with *Waziristan*, pl. I:SD38, compare also the relief bands of pl. 35:5, 6 (often repeated) with *Waziristan*, pl. I:SD29, SD33 and our pl. 47:12—15 with *Waziristan*, pl. I:SD43, where a black pattern seems to have been painted on a white ground.

A number of the same designs occur at Chicha-dherai, but certain other comparisons can be noted; the chequer pattern *Waziristan*, pl. II:ChD9 and ChD13 compared with our pl. 39:3 and the leaf pattern, *Waziristan* pl. II.ChD 15 with our pl. 34:7. Certain ornamental details from Chaudhwan have an affinity with Rang Mahal. The small leaves in the border of the vessel represented in our pl. 34:8 can be compared with *Waziristan*, pl II:Ch4, and it seems that a certain resem-

[1] Cf fig. 103 a

[2] *Historical Sites*, p. 150

[3] *Waziristan*, p 8 This is with special reference to Surkh-dherai, but Stein continues (p 9) "there is good reason to assume that the occupation of the Chaudhwan site extended approximately over the same period as that of Surkh-dherai" (he acknowledges the possibility of a somewhat later origin of three of the fragments, *Waziristan*, pl II Ch6, Ch11, Ch13) Concerning the pottery of Chicha-dherai he says (p 10) that specimens like that illustrated in *Waziristan*, *pl II ChD8—18 display motifs reminiscent of designs* "found *on pottery from chalcolithic sites*" (cf however the parallels sited below between a number of Waziristan sherds and pottery from Rang Mahal) Other objects from the same site he finds "suggestive of later origin", as *Waziristan*, pl. II ChD2, 3, 5 and 6.

[4] Ibid, p 8 f

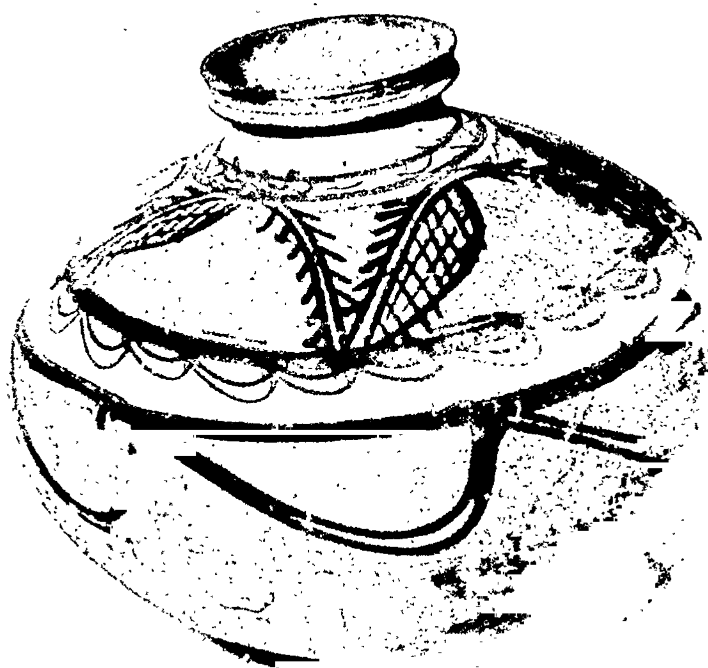


Fig. 103 a. 1/4. Modern pottery, fabricated in Suratgarh 1954.

blence exists between the bell-shaped flowers of our pl. 20:2 and 31:2b and *Waziristan*, pl. II:Ch 12—13 and Ch1. Finally our pl. 37:10 corresponds to *Waziristan*, pl. II:Ch11, in both cases it is doubtful whether the painting represents birds or flowers. The affinities between the pottery decorated with relief-bands adds to the evidence provided by the painted pottery of the two areas. Our pl. 62:6 can be compared with *Waziristan*, pl. II:ChD8; incisions on bowls and vessels like those on our pl. 65:7, 10 pl. 61:4,5 can be compared with *Waziristan*, pl. II:Ch16 and I SD 1. "Wolf-teeth" patterns on spouted jars (pl. 46:2, 3) and cooking vessels (pl. 56:3—5) can be compared with *Waziristan*, pl. II:Ch23 and the undulated ribbing of the lower part of many globular pots (e.g. big pot pl. 22), and more especially of our spouted pots, pl. 48:1, 2, 5, can be compared with *Waziristan*, pl. I:SD 10 and 12. The decoration round the spout of such vessels as that illustrated in pl. 47:10 has a counterpart in *Waziristan*, pl. I:SD2. The Rang Mahal moulded pottery of the type illustrated pl. 69:6,7, 12 is of the same kind as *Waziristan*, pl. I:SD 27, SD 9 and pl. II:Ch15. The Waziristan material also includes knobbed lids (*Waziristan*, pl. II:ChD6), a handle, *ibid.* II Ch D1 (perhaps from an incense burner) and figurines with small notches, *ibid.* II: Ch D2, — all types commonly found at Rang Mahal.

Notice should also be taken of certain fragments from Mastung in Baluchistan which have affinities with both the Waziristan and Rang Mahal material. The finds include fragments of a relief band from a globular pot (Stein, *Gedrosia*, pl. XXXII:SBul. I, 1), as well as the handles (*ibid.*, pl. XXXII:Sam 1 and SBul 8). Stein dates the finds to the early centuries of our era (*loc. cit.* p. 188).

The affinities between the painted pottery from Rang Mahal and Waziristan have been examined at length. The reason for this is that I believe that we must look to the north for traces

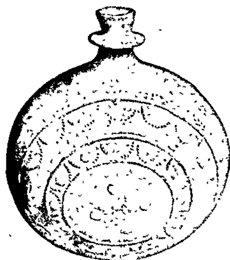


Fig 103 b 1/4 Modern pottery, fabricated in Suratgarh 1954

of the survival of a painted pottery tradition which produced, ultimately, the Rang Mahal ware. Further explorations in that area may confirm this theory.

It is only natural to trace the Kushan culture to the north or north-west, and it is not surprising to find that it spreads out over the subject area in a more or less fully developed form

The systematic excavations which have taken place since 1953 in North-Western India in an attempt to find a site producing both Harappa pottery and Painted Grey Ware, both of which have been found separately in the region, have given us a most accurate cultural sequence. It has been shown that at the sites of Hastinapura[1] and Rupar[2] there was a distinct break and not an overlap between the Harappa and Painted Grey Ware levels. Ghosh advises however against any premature judgement Rupar demonstrates one thing, "but other sites having a different tale to relate may not be lacking". While it is admittedly premature to hold that the Painted Grey Ware people "were no other but the Aryans, it is doubly premature to say that the Aryans had nothing to do with the disappearance of the Harappans. Even if that be the future concensus, the possibility will remain that the descendants of the Harappans, after the end of their glorious days, lived somewhere in India, still holding to their culture, in a modified form, to contribute its traits to the pattern of Indian culture, either directly or through the Aryans or some other agency. Otherwise, the existence of the Harappan elements in Indian culture will remain unexplained".[3]

When I had finished my discussion about the source of the Rang Mahal pottery without being able to disregard the possibility of the survival of a Mohenjo-Daro/Harappa tradition, and

[1] Lal, *Hastinapura*, Table I

[2] Sharma, *Historical Sites*, p 96, 123 ff, fig 4

[3] Ghosh, *Notes*, p 3

had also observed its affinity to ceramics from Gujarat and Kathiawar, there came into my hands Subbarao's The Personality of India[1], where he suggests "that the Bikaner area was some sort of a rendezvous with various elements apparently converging, but in fact diverging from this point." Subbarao points to the very great importance of what he calls that "Proto-historic-Trijunction", according to which the Harappan civilization spread along the river Ghaggar (Vedic Sarasvati) into the Bikaner area ... without crossing the Aravallis, while the second element, the Grey Ware culture, moved straight from the upper Indus basin into the Gangetic.[2] Later on the same author stresses that the Swedish excavations at Rang Mahal and Ratanchand Agarwals at Bhinnamal "show a continuous survival of the Black-on-red painted pottery right into the early centuries of the Christian era ... This suggests that the area west of Aravallis belongs to a different ceramic zone, which includes North Gujarat — and Kathiawar." He draws the conclusion that as "the function of Rajaputana and the Aravallis in the historical geography of India has been one of absorbing the fugitive elements from Punjab and Central India", it could have been "a sort of a refuge zone for the fugitives of the Upper Indus basin, displaced by newcomers and conquerors, e.g. foreign and Central Asian tribes, like Scythians, Hunas, Mers etc."[3]

Subbarao's statements coincide in a very acceptable way with my own speculations: There are Harappa elements in the Rang Mahal pottery, a fact that is stressed through their affinity to that of Waziristan. We have not been able so far to show the cultural continuity century by century; on the other hand, the Rang Mahal pottery is no *new creation* — already at the earliest levels at Rang Mahal it had reached a fully developed stage, and the culture was not built upon that of the Painted Grey Ware.

Spouted jars

I have shown that spouted jars are of frequent occurrence at Rang Mahal: the form is not much published from other sites. Ghosh and Panigrahi[4] illustrate one spouted, handleless jar from Ahichchhatra (fig. 6:62) which has a general resemblance to the vessel illustrated in our pl. 44:1. The Ahichchhatra jar is referred to Stratum II, which is dated between 750 and 850 A.D. This dating is at odds with the dating of the Rang Mahal jar which came from a lower level. From Bhita, comes a handleless spouted jar published by Marshall[5] which, although it has a flat base, is similar to the vessel we illustrate in pl. 45:1, 2, the rim is perhaps closer to that illustrated in pl. 45:9. The jar from Bhita is dated by Marshall to the Kushan period. I have already drawn attention (p. 144) to the striking resemblance between fragments of spouted jars from Waziristan and certain finds from Rang Mahal.

We do not know whether the Waziristan fragments illustrated in pl. I:*SD* 10, 12, came from jars which have no spouts or from spouted jars with nozzle- or funnel-shaped necks (cf. pl. 48:1, 2 and 5). The type of jar appears, from the published material, to be uncommon. A neck similar to our 48:12 occurs at Brahmapuri (Kolhapur, Deccan)[6] but the form of the jar is not

[1] *ibid.*, p. 45.
[2] However, there exist Grey Ware sites also in Bikaner. We have Bareke quite close to Rang Mahal.
[3] *ibid.*, p. 57.
[4] Ghosh and Panigrahi, *Ahichchhatra*. Marshall, publishes several spouted jars (Taxila, I; pl. 123) and says that numerous specimens are unearthed at Taxila (Taxila, II, p. 414).
[5] Marshall, *Bhita*, pl. XXX:53.
[6] Sankalia and Dikshit, *Brahmapuri*, fig. 22:14, compare also fig. 20:99.



Fig 104. 1/1 Spout of the same type as pl 47 16 From Bhamantheri

known, perhaps it is possible to parallel the type[1] with the spouted jar from the Jaulian Stupa, published by Marshall, *Taxila*, III, pl. 123·68. Similarly we are unable to say whether the fragment of pottery from Waziristan with a black paint on a white ground (*Waziristan* pl I·SD43) belongs to the type of spouted jar in our pl. 47·11—13, 15. The same applies to two fragments with this kind of painting from Vadnagar (Bombay state) (Subbarao and Mehta, fig. 12·29 and 13:35). This pottery, designated as "Medieval Painted Ware", is assigned by the authors to their Period III as similar painted ware occurs at Baroda in Period III[2] (i.e. 600—1000 A.D.) and at Timbarva. They add, however, "apparently the fabric appears to be somewhat earlier at Vadnager". At Rang Mahal the few fragments recovered come from the higher levels of trench II and I: A6.

The spout in the shape of an animal's head (pl. 47:16, pl. 82.55) occurs only once at Rang Mahal although another example (fig. 104) was found on the surface not far away at Bhamantheri. These have their counterpart at Taxila where a similar spout was found in the Jaulian Stupa (Marshall, *Taxila* III, pl. 123·69), which is supposed to have been destroyed "in the latter part of the fifth century A.D.".[3] Two spouts from Bhita are illustrated by Marshall (*Bhita*, pl. XXIX:20 and 46): one was "crocodile-shaped" of a "buff coloured clay with red paint or glaze" and found below the Maryan floor; the second spout, "from a vessel which seems to have been shaped like a tortoise" is assigned to the same period and described as being of "very fine buff clay with a red paint".

Sprinklers — Red Polished Ware

In recent years sprinklers of Red Polished Ware, of the type found at Rang Mahal, have attracted a great deal of archaeological attention and new finds have been reported frequently, their distribution gradually widening. Sprinklers are almost completely absent from Taxila although one piece (Marshall, *Taxila* III, pl. 123.66) appears to resemble our fig 68:4. Marshall (*ibid.* II, p. 414) describes it as "of sandy red clay with a darker red wash outside. Height 5,5in Squat form with round bottom. Perforation at the base of spout." It was found in Bhir Mound, stratum II, and is dated to the Maurya period. The sprinklers found at Hastinapura came from the period IV levels, which form a partial chronological coincidence with Rang Mahal although Hastinapura IV is presumed to have been deserted towards the end of the third century A.D. (cf. Lal, *Hastinapura*, p. 19). Lal's fig. 20:XV and XVI illustrates necks with both closed and open mouths. Lal

[1] Or perhaps rather our pl 48 15

[2] Subbarao, *Baroda*, fig 22 and p 50

[3] Marshall, *Taxila I*, p 387

(*ibid.* p. 65) quotes sprinklers of red polished ware at Kausambi, Jhusi, Lachchhagiri and Somnath, adding the word "etc." The type is rare at Ahichchhatra; the specimen by Ghosh and Panigrahi (fig. 3:43; p. 46) has an open mouth which, in shape, most closely resembles our pl. 49:11; it has a flat, slightly concave base (cf. our fig. 68:7). Marshall reproduces one vessel from Bhita (pl. XXX:52) which he calls (p. 83) "the lifebreathing vessel of the Chinese pilgrims". It has a "high top with projecting rim, pierced with small holes, short plain spout, turned upwards, round bottom. Fine buff clay with red paint", dated to the Kushan period. From Rairh, Puri reproduces (pl. XI:11) a "narrow-necked vase" which seems to be a sprinkler with an open mouth. This is described (p. 21) as "Buddhist pottery" imported from abroad. "The pink paste of which the vase is made is so carefully polished that it presents a stonelike appearance." According to Puri such specimens have been "found in the upper levels at Mohenjo-Daro, dated about the beginning of the 3rd century A.D. at Bairat and Rajagriha in Bihar". He is "inclined to assign this fine vase to (the) 2nd—3rd century A.D." At Rupar sprinklers with both closed and open mouths are found in Period IV, circa 200 B.C.—600 A.D. (Sharma, *Historical Sites*, fig. 4:IV:3, fig. 6:10, 11 and p. 126). Sharma also lables the sprinklers as "foreign".

The sprinklers are not restricted to the more northerly parts of India; Sharma (*ibid.* p. 158) reports them from Western and Central India.

Subbarao in his work "Baroda through the Ages" (1953) published many important finds of Red Polished Ware and illustrated several fragments of different types of sprinkler."[1] In a later book "The Personality of India" (1956) he demonstrated the widespread occurrence of this type of pottery throughout Gujarati and Kathiawad in the Kshatrapa period.[2] He sees an important technical affinity between the Roman red wares and the Red Polished Ware; an influence attested by the presence of classical antiquities in India — a fine cameo from Karwan, a bronze handle decorated with the figure of Eros from Baroda and Graeco-Roman clay seals from the ancient Ankottaka, the village of Akota near Baroda.[3] Remarkable recent excavations at Nevasa, Ahmednagar, in Bombay state[4] have produced fragments of sprinklers in the Satavahana layer together with an amphora of Mediterranean origin and a coin of Tiberius (or an imitation of one). Among the Red Polished Ware a few sherds are said to be "definitely Samian in character". Certain interesting finds have occured in Satavahana layers at certain sites in the Deccan; at Bahal in Khandesh[5], at Brahmapuri on the outskirts of Kolhapur, at Chandravalli in Northern Mysore and at Kondapur in Hydrabad.[6] At the two latter sites Red Polished Ware occurs in association with clay imitations of Roman coins, while at Brahmapuri a number of fine Roman bronzes were found — a trefoil-mouthed handled jug, a Poseidon statuette, and a dish with figures in half relief.[7] Most interesting is the occurrence from the Satavahana kitchen floor at Brahmapuri of a complete sprinkler which closely resembles a spouted vessel of bronze from the same site.[8] Both the clay and the bronze vessels have flat bottoms and very low foot-rings. A sprinkler with flat bottom, but no foot-ring, occurs as told above at Rang Mahal (fig. 68:7).

[1] *Ibid.*, p. 32 f. and fig. 13, p. 56 f. and fig. 24., cf. also Subbarao and Mehta, *Vadnagar*, fig. 14.
[2] *Personality of India*, p. 61.
[3] Subbarao, *Baroda*, p. 57.
[4] *Indian Archaeology*, 1954—55, p. 5 f.
[5] Subbarao, *Baroda*, p. 57.
[6] Sankalia and Dikshit, *Brahmapuri*, p. 141.
[7] Sankalia and Dikshit, *Brahmapuri*, p. 82 and fig. 22. Especially cf. p. 61 and pl. XIX:A with pl. XXXIII:D. Cf. Wheeler, *Cultures in Mysore state*, p. 280, the Brahmapuri vessels illustrated in fig. 46.
[8] Cf. Sankalia and Dikshit, *Brahmapuri*, p. 61.

It can be seen therefore that there is ample evidence as to the dating of the Red Polished Ware. Most writers presume the very plausible theory that it was manufactured under Roman influence. It is very much more difficult to decide whether the form is foreign or whether the sprinklers are imported. The bronze sprinkler from Brahmapuri is the only specimen that can be looked upon as a metal prototype; it is unfortunately impossible to say whether it is a Roman object and, if so, where it comes from within the Empire; it is not a well-known type. No pottery examples, in any considerable quantity, are known outside India. I do not agree with those authors who believe that all the vessels were imported.

The differing quality of the ware of the Rang Mahal specimens makes it more probable that not all the vessels came from an industrial pottery but that some at least were made locally; for example the vessel in fig. 68:6 is not polished. In any case the type is of little practical use — and from that respect it can be called "de luxe"[1] — it seems quite probable that it had some special application, probably religous and perhaps Buddhist as has been hinted at by Puri.

As mentioned above (p. 110) one piece of Red Polished Ware (the spouted jar pl. 47.8) found at Rang Mahal is not to my knowledge paralleled elsewhere. It is the only distinguishable specimen of its kind, though it is possible, of course, that vessels other than sprinklers are represented among the numerous small fragments of this fabric.

Type 6, 7, 8

The grey sprinkler (pl 51:7) seems to be an unusual type. In shape it is somewhat similar to a bottle of "exceptional form" from Sirkap, phase IV (Goosh *Taxila*, fig. 14:IV); the fabric of this example however is red in colour.

As far as I know the type represented in our pl. 51.3 is not found elsewhere. It can certainly be compared (in idea and usage) with the water bottles from the Jaulian Stupa (Marshall, *Taxila*: III, pl. 122·45) This Taxila type is in frequent use in the Rang Mahal region to-day [2]

The type illustrated in pl. 51:4 and 5 is not known to me from other sites

Vessels with textile impressions

Fragments of vessels with internal textile impressions are found at some other sites of the same age in the Rang Mahal region; they seem, in fact, to be indigenous to this area. To date they have not been noted from other areas.[3]

Cooking-vessels and pans

Cooking vessels of the type illustrated in pl. 53—61:3 and figs. 71 and 72 are more widely dispersed in a variety of forms. Great numbers of this type of vessel were found on the site and varied considerably in form. Certain parallels can be drawn with vessels from Sirkap (Ghosh, *Taxila*, fig 10·45) which "occurs fairly frequently throughout the occupation of the site" (*ibid.* p. 59) Unfortunately the illustrations in most publications show only the shape of the vessels and

[1] Cf Wheeler, *Cultures in Mysore state*, p 28, Sankalia and Dikshit, p 61

[2] Cf fig 103 b

[3] Quite different is the "mat"-impression on the outer surface of early pottery from Ankamedu, cf Wheeler, Ghosh and Krishna Deva pl XXXII B·4, XXXI C 3 and 4.

yield little opportunity for the study of further similarities; e.g. the presence of applied ribbing on the lower part of certain vessels which is typical at Rang Mahal. Certain carinated vessels from Ahichchhatra correspond closely in shape to our material (Ghosh and Panigrahi, *Ahichchhatra*, fig. 2:27 from stratum IV, dated between 100 and 350 A.D. and fig. 3:45). The vessels with indentations of the rim illustrated *ibid.* fig. 6:67 (stratum III—I, dated 350—1100 A.D.) and fig. 6:65 (stratum I) seem squatter than any of the Rang Mahal types; however the indentations of the rim of the vessel illustrated *ibid.* fig. 6:65 and the lug (but not the T-shaped rim) of the vessel *ibid.* fig. 6:67 are closely related to certain vessels found especially in the upper and middle levels at Rang Mahal. Certain types from Hastinapura resemble in shape the vessels illustrated in our fig. 71:2 and 1; these parallels are illustrated by Lal *ibid.* fig. 19:XLI (early level of period III), fig. 21:XXXIII and XXXIIIa (period IV). Marshall illustrates[1] two cooking vessels from Bhita which are of similar shape (*Bhita*, pl. XXX:57 and 79). Both have a rounded base and no ridge, the first is from the Kushan level and the second is from the Gupta level. Among the various types from Bangarh (Sunga period) Sharma illustrates the profile of a cooking vessel with a prominent ridge (*Historical Sites*, fig. 12:II:6). Other sites have certainly produced this type but they remain unpublished.[2] I have drawn attention above to those vessels which have rims decorated with indentations and which have applied perforated lugs; a parallel can be mentioned from Hastinapura, as well as from Ahichchhatra, in his publication of this former site Lal illustrates a decorated vessel (fig. 28:XXXVI) which belongs to his period V, i.e. later than 1000 A.D. The decoration of the rims of the Rang Mahal pottery is more varied than that which occurs on any other published site. The last named vessel from Hastinapura is also decorated horizontally on the body with painted black strokes. Sir Aurel Stein (*Reconnaissance*, pl. I: Nang. 9 and pl. II: Gur. 1) publishes two rim-sherds, one from Nangal on the Jhelum river and the other from Gurtala in the Shahpur district, which strikingly resemble the decoration and painting of the Rang Mahal pottery (cf. the Gurtala sherd with that illustrated here pl. 57:6). But so far no material has been published which compares in variety with the patterns painted on the later Rang Mahal pottery.[3]

The rare loop-shaped handles (pl. 61:9, 10) have been assigned to pans or troughs. This form is rare throughout India; Ghosh and Panigrahi (*Ahichchhatra*, fig. 2:21) assign them to the period between 100 B.C. and 100 A.D., Puri illustrates another fragment from Rairh. Further examples are recorded from Bhir Mound and Sirkap (Marshall, *Taxila*, III, pl. 124:112, 113), where they are described as "baking-pans" (*Taxila*, II, p. 419). The Taxila pans are more elaborate but are certainly of the same kind. Lal (*Hastinapura*, fig. 16:XXIa) illustrates a "basin" with horizontally out-turned loop-like handles which he assigns to the middle of his period III. Another fragment belonging to the Pala period was found at Bangarh (Sharma, *Historical Sites*, fig. 12:IV). Wheeler, Ghosh and Krishna Deva (*Arikamedu*, p. 63) say that "handled fryingpans are extremely rare" (they illustrate some, fig. 21:25 o-r).

[1] The reproduction is not very clear.

[2] Type 24 from Arikamedu. Wheeler, Ghosh, Krishna Deva, *Arikamedu*, p. 61 demonstrates a general resemblance to the Rang Mahal type; but there are no ridges at the carination and the mouth is usually very wide in relation to the greatest diameter.

[3] In the region of Rang Mahal the type is, however, common, cf. our fig. 102:3—5, the latter matches fig. 73.
One can note in our discussion of the cooking-pots that vessels, similar in shape to those found during our excavation, continue in use to the present day in the village of Rang Mahal.

Storage jars

Large storage jars of the type illustrated in fig 76, pl 62.3—6 (fig 77:1—3) and fig. 78 are known from many farflung sites. They are found at Taxila both in Birh Mound and throughout the site at Sirkap (Marshall, *Taxila* III, pl. 121:1,2 and Ghosh, *Taxila*, fig. 13:76). Four examples of the type illustrated by Marshall, pl. 121·1, were found in Birh Mound (in the Maurya stratum) where they had been used in the construction of a soak-well[1]; they had the same relief band round the neck as can be seen in our fig. 76 and 77:3. The same pattern, but applied to the shoulder of "storage jars", is recorded by Ghosh and Panigrahi from stratum IV at Ahichchhatra (fig. 8 16) and by Marshall from the Gupta period at Bhita (pl. XXX 72) Subbarao (*Baroda*, fig. 21 94) illustrates an irregular jar with the same pattern but of a very much later date. This jar is interesting in itself because of its pointed base which very closely resembles the vessel we illustrate pl 62:7. Puri illustrates an enormous undecorated jar from Raith. A fragment of a heavy jar with the same thumb-impressed ornamention as our pl. 62.6 is illustrated by Ahmed from Kondapur[2] (per. cir. 200 B.C.—cir. 200 A.D.)

Grooved rims of the type illustrated in pl. 62:1 (fig. 77 6) are known from other sites but they seem to belong to smaller jars of a more globular shape (e.g. Ghosh, *Taxila*, fig. 9:39; Lal, *Hastinapura*, fig. 21:XXXVII).

Tripods like that illustrated in pl 62.8 are apparently of infrequent occurrence The fragment illustrated by Lal, *Hastinapura*, fig. 19·L has a perforated base, it comes from an early level of his period III.

Vases, bowls and lids

Smaller vases of the type illustrated in pl. 64:14 and fig. 80:3 are paralleled outside Rang Mahal. The carinated vessel, pl. 64:14, could be compared to Lal, *Hastinapura*, fig. 19:XLVII (which is however from an early level of his period III). The vessel illustrated in our fig. 80:3 can be compared to vessels illustrated by Ghosh (*Taxila*, fig. 13.65a) and Lal (*Hastinapura*, fig. 20:XXVIc).

The very small vases of the type illustrated here in pl. 63 have perhaps not been very widely published as they cannot be considered "leading" types. It is worth mentioning, however, that small vessels of this kind do occur on other sites, perhaps used to hold perfume or as toys, and they differ widely in form from other pots. Although they are not exact parallels we could perhaps compare our pl. 63:1—15,17 with Ghosh, *Taxila*, fig. 13:65—67a (which were found at all levels on the site) and Lal, *Hastinapura*, fig. 20:XXV—XXVa, XXVIb (which belong to his period IV).

I do not know any direct counterparts to the beakers and goblets of Type 18 (pl 64:3,7,8 (fig 84:1,2,3)). Certain goblets from Sirkap (Ghosh, *Taxila*, fig 12·53,54) are related to the Afghanistan pottery from Bégram (Ghosh, *Taxila*, fig 11)[3] and show slight resemblances to the Rang Mahal beakers, e.g the flat base and the outward sweep of the walls. The bases of the Sirkap

[1] Marshall, *Taxila* II, p 405 Debevoise, *Parthian Pottery*, p 18 f tells how, at Seleucia, old storage jars were placed under a brick drainage hole in the centre of the courtyard The vessel from Rang Mahal illustrated in fig 76 was certainly used in a similar fashion (see above p 67 f) This type of storage vessel, generally speaking, is of common occurrence in the Orient (cf Debevoise, *ibid*, p 60 and 61, fig 7, 95—97 and 99)

[2] Ahmed, *Kondapur*, pl III a

[3] Ghirshman, *Bégram*, pl XL, B G 107 (the second city, which starts with Kanishka I)

goblets are smaller and thicker; its prototype was of metal (Ghosh, *ibid.* p. 62); the goblets commonly occur at all levels of the Sirkap site. Goblets on stands occur at Rupar in the early centuries of the Christian era (Sharma, *Historical Sites*, fig. 6:22—24).

Bowls are found very commonly at Rang Mahal, as in other sites, and there is a great variety of forms. An interesting form is that of the globular jar or bowl of Type 19, fig. 85. This is hard to parallel in the published material, but one of the "atypical" pots from Sirkap, Ghosh, *Taxila*, fig. 14:XIX is strikingly similar — it is dated to the first century A.D.

Bowls of the type illustrated in pl. 66:1,2 and fig. 86:1—6,8, fig. 87 are of a long-lived form. We may however hint at certain parallels. Such a bowl as our Type 20 C (pl. 66:2 and fig. 88:8 and fig. 88:6) can be compared to a vessel illustrated by Ghosh (*Taxila*, fig. 6:27g). Certain specimens of this type from the upper levels at Rang Mahal are decorated with patterns executed in black paint (e.g. pl. 65:4—5,8). Bowls are also found at Sirkap which, while not of exactly the same shape, have a painted geometrical decoration (Ghosh, *Taxila*, fig. 3:1c,d,m,n, 2a). With the exception of the vessel represented in fig. 3:1d these "occur fairly frequently in all periods of occupation"[1] The Rang Mahal Type 20 A (fig. 87:1,2,4) corresponds to the vessel illustrated by Ghosh, *Taxila*, fig. 4:11. Similarly our fig. 87:9 resembles Ghosh's fig. 6:27 and our pl. 87:12 resembles Ghosh's fig. 7:31c.

Less common forms, as our Type 20 F (fig. 89:1 and 2), have an affinity with that illustrated by Wheeler, Ghosh and Krishna Deva, *Arikamedu*, 38:145, where it is taken to be a large store jar. Only one specimen of this type (fig. 89:1) occurs at Rang Mahal (although a closely related type is illustrated in fig. 89:2). The type is apparently rather frequent at Arikamedu and, although only found in fragmentary condition, this type occurs "throughout the occupation of both Sectors" (i.e. the Northern and Southern). The ware "is generally grey in colour in the pre-Arretine and Arretine layers of the Northern Sector and greyish-red elsewhere".

Wheeler, Ghosh and Krishna Deva, *loc. cit.*, fig. 33:96 illustrate a type of deep bowl from Arikamedu which is of interest in relation to our fig. 89:8. The type is rare at Rang Mahal but is slightly more common at Arikamedu where it appears throughout the sequence in the Southern Sector (mid-first century to the end of the second century A.D.) Closely related to this type and to other bowls with straight walls is an "atypical" bowl from Sirkap (Ghosh, *Taxila*, fig. 14:I) which comes from Pit 6 and is dated to the period of the Birth of Christ; this could be compared especially with our fig. 89:7.

The vessel represented in fig. 89:10, which is a unique late specimen found in the highest level of trench II, can be compared to Subbarao, *Baroda*, fig. 18:58 which is dated to a period after 600 A.D. It should be noted, however, that the profile of the Rang Mahal bowl is more accentuated. The Baroda bowl is in plain grey ware.

The more or less funnel-shaped bowl (illustrated in fig. 89:15) can be compared to that illustrated by Ghosh, *Taxila*, fig. 6:27f, which is a common type occurring at all levels of the excavation.

The simple bowl with rounded base and featureless rim of our type 20:0 (fig. 89:19) can be compared with Lal, *Hastinapura*, fig. 20:V, which came from an early level of period IV.

[1] Ghosh, *l.c.*, p. 50.

We have already mentioned the resemblance of the burnished thin black ware, fig. 92:1 with the Northern Black Polished Ware (cf. Ghosh and Panigrahi, *Ahichchhatra*, fig. 10:XIII, from Rajghat).

The thin grey, smooth surfaced ware represented in fig. 92·2 has a fabric reminiscent of the unpainted Grey Ware recorded by Ghosh and Panigrahi, *Ahichchhatra*, fig. 1:7 and p. 40 f.

Bowls like those related to pl 65·1—3, fig 91:3,4 and 10 are paralleled at Sirkap. It is possible to compare Ghosh, *Taxila*, fig. 5:17a with our fig. 91·4, his fig. 5.23 with our pl. 65·1 and 2 and his fig. 5:24 with our fig. 92:3. These types are found throughout the site at Şirkap.

The small bowls illustrated in fig. 91:5 and 7 are slightly reminiscent of certain "exceptional forms" from Sirkap (Ghosh, *Taxila*, fig. 14:XIV and X — the latter dated to the first century A D.) and of another bowl from the early years of our era, found at Rupar (Sharma, *Historical Sites*, fig. 6:25).

Cups and bowls of the types illustrated in our pl. 67:1—6, fig. 91.1—6 are known from Sirkap (Ghosh, *Taxila*, fig. 4·9 and, especially, 9a).

Conical bowls like those illustrated in pl. 67.7,8 and fig 93:1—9 occur in varying form in great quantities on many North Indian sites It would be tedious to catalogue them all here, but we can mention a few illustrated by Ghosh (*Taxila*, p. 52, 53 and fig 4:4,5,10—10c) The form also occurs, for instance, at Arikamedu (Wheeler, Ghosh and Krishna Deva, fig. 18:12), where it is found at all levels of the Southern Sector and more rarely in the Northern Sector — in the Northern Sector the fabric is generally grey in the pre-Arretine and Arretine levels and red in the post-Arretine levels.

Lids with a knob-handle of the type illustrated in pl 67:9, 10 and 12, fig. 93:10—15 occur in such early contexts as Mohenjo-Daro (Marshall, *op. cit* III, pl LXXVIII:7, LXXXII.36—46). Marshall mentions (*op. cit.* I, p 308) similar forms from Jemdet Nasr in Mesopotamia ("provisionally dated to about 3500 B.C.") and also hints at Bronze Age parallels in Southern Italy and corresponding forms in modern Sind Although they may not be found in quite the same numbers these lids are just as common as the conical bowls.[1] Ghosh, *Taxila*, illustrates a series of lids (pl. 7·34—35 a) of which the last mentioned example may be compared with the heavy knob we figure in pl. 67·12 and fig. 94:16 and 17. Marshall, *Taxila*, illustrates (pl. 126:188) the same type from Bhir Mound; he also illustrates a lid without a knob which can be compared with our pl. 67:11, he hints at similar coverings from Parthian Mesopotamia.[2] Sharma (*Historical Sites*, fig. 6:21 and 28) has illustrated a series of similar lids from Rupar, as well as one (fig. 6:27), without a knob, from the early centuries of our era

The knobbed lids are rare at Arikamedu in Southern India in the pre-Arretine and Arretine periods (Wheeler, Ghosh and Krishna Deva, fig 23:36)

Stands, lamps, incenseburners

Jar-stands like fig. 96.1 are common at Mohenjo-Daro (Marshall, *op. cit.* III, pl. LXXXIII:45—51, 53—60) Examples from Bhir Mound and Sirkap (Marshall, *Taxila*, III, pl. 127:204a—c) are

[1] For a similar lid from Waziristan see above p 144

[2] Debevoise, *Parthian Pottery*, p 46 and fig. 20—29 The bigger specimens seem more to be bowls as our fig 93·1—9

strikingly similar to that illustrated in our fig. 96:1, while another stand occurs at Ahichchhatra, stratum VI, dated 100 B.C. to the Birth of Christ. (Ghosh and Panigrahi, fig. 2:26). Similar stands occur at Arikamedu (Casal, Virampatnam-Arikamedu, fig. 19:62, especially 62a).

Small lamps of the type illustrated fig. 97:1—2 are of widespread occurrence and it is unnecessary to catalogue their distribution here: they are common in all ages and survive in modern communities. A rare type of lamp is that which is set on a stand of the form depicted in pl. 97:3, they have a lip similar to that of the small lamps mentioned above. I do not know any immediate parallels to this type. The lamp, or incense burner, depicted in fig. 97:4, can be compared to an example from Sirkap illustrated by Marshall (*Taxila*, III, pl. 125:132a) where it occurs in stratum II, i.e. late Saka-Parthian period. Similar lamps found here and there at all levels of Sirkap are figured by Ghosh (*Taxila*, fig. 12:58—58g). This form almost certainly originates in a metal prototype of the form recorded by Marshall from the Greek or early Saka levels at Taxila (*op. cit.* III, pl. 176:323—327).

Incense burners, both with and without handles (pl. 68), occur at various places. We may compare the Rang Mahal examples with parallels from Sirkap (Marshall, *Taxila*, III, pl. 125:133 and 134), from stratum III (i.e. 350—750 A.D.) at Ahichchhatra (Ghosh and Panigrahi, *Ahichchhatra*, fig. 3:47), where they have no handle and a solid pedestal and from stratum I (i.e. later than 850 A.D.) at the same site where they occur without a handle and with a hollow pedestal (*ibid.* fig. 6:75). Further examples are recorded from the early (i.e. eleventh century) phase of period V at Hastinapura (Lal, *Hastinapura*, fig. 27:XVII, XVIIa), where the type is handled and decorated with incised lines and has a hollow pedestal, from period VI (1300—1700 A.D.) at Rupar, where a handle occurs (Sharma, *Historical Sites*, fig. 4:VI:1) and, without a handle, from the Gupta period at Bhita (Marshall, *Bhita*, pl. XXX:89). Although there is an obvious affinity with certain of these pieces no exact parallel is known. The parallels with copper and bronze examples from the Greek and Parthian levels at Taxila are important (cf. Marshall, *Taxila*, III, pl. 176:320—322); these objects have been related by Marshall to pottery examples. We can in this light see the nandi on the top of the handle of the vessel in pl. 68:1 as a late and simplified version of the galloping lions from Taxila.

Perforated pottery

Perforated pottery is rare at Rang Mahal and other contemporary sites. Small vessels, as fig. 99, were obviously used as strainers or colanders. Marshall (*Taxila*, II, p. 614) has discussed the use of silver strainers and their prototypes; he compares them with pottery examples and suggests that the prototype is the Greek "kalathos", a basket used for straining milk. This interpretation may be valid for the funnel shaped type on which the only unperforated portion of the vessel is the border (Marshall, *op. cit.*, III, pl. 187:19). The shape of this vessel could perhaps be compared to the pot from Rang Mahal illustrated in fig. 99:3. The vessel represented in fig. 99:1 is in some respects similar to the pottery strainer from stratum V (Greek period) at Sirkap (Marshall *op. cit.*, III, pl. 124:122, I, p. 127). The silver strainers are later at Sirkap, occurring in stratum III, while the pottery strainers (pl. 125: 123 and 124) come from the Jaulian Stupa and Jandial.

Perforated pottery is found throughout the [illegible]. The pots seem to be larger than ours and the fabric coarser (Wheeler, [illegible] Krishna Deva, [illegible], fig. 34:118—119a).

M[illegible]

The moulded pottery is worthy of special [illegible] it has counterparts on several other Indian sites. Undoubtedly this pottery [illegible] inspiration to the *terra sigillata* of the Romans. This fine pottery, which imitated [illegible] silver ware, was enthusiastically received and imitated in Roman-occupied Western Europe and, although the actual period of manufacture in Italy was of short duration, provincial manufacture continued for many centuries.[1] The pottery reached India by way of Asia Minor and North Africa and, as happened elsewhere, it was imitated and copied. Imitators made this technique longlived in India. In reality the technique has never died; consider, for example, the modern water bottle from the Rang Mahal region illustrated in fig. 103 b.

Terra sigillata reached India in the first half of the first century A.D. At Arikamedu, the Indo-Roman trading station of the east coast of India, importation of Arretine ware is dated to between 20 and 50 A.D., at which date importation of this type of pottery ceases.[2]

Local imitations of this ware occur both at Bhir Mound and at Sirkap at Taxila where embossed pottery "definitely Hellenistic in character" was also found.[3] In later periods simpler wares with geometrical patterns comparable to some of our examples occur. For instance rosettes and lotus buds are to be seen on a fragment from Rajran and small stars are to be seen on the mould of a bowl from Dharmarajika (Marshall, *Taxila*, III, pl. 131:244 and pl. 131:245 (pl. 128:245)). The bowls which were made from this mould could be compared to our pl. 60:2, 6, 9, and 10 (fig. 100:2—6). Rosettes and stars are of common occurrence on this type of pottery, we have them on the Rang Mahal bowls pl. 60:6—8 and on the moulds pl. 60:15 and 16. We see them again on fragments collected by Stein in the Shapur district, Punjab (Stein, *Reconnaissance*, pl. 1: Amra 14 and 8, RP3 and 6). Further fragments occur at Rupar, with such early material as the Northern Black Polished Ware (Sharma, *Historical Sites*, fig. 5:21 and 22). The same motifs are found on bowls and fragments from various strata of Ahichchhatra (e.g. those from stratum IV illustrated by Ghosh and Panigrahi, *Ahichchhatra*, fig. 7:5—8, 10, 12 and fig. 8:13 and from stratum II, fig. 5:60). The panel of Leaf-design illustrated *ibid.* fig. 7:12 is somewhat similar in shape to our fig. 69:8 and 11. The same pattern is found at Hastinapura (Lal, pl. XXXI:7). It is interesting to compare this leaf-pattern with the fine pattern stamped on the base of a dish of a rare type from Arikamedu (Wheeler, Ghosh, Krishna Deva, fig. 36:141).

Further north a few pieces were collected by Stein at Surkh-dheri (*Waziristan*, pl. 1:SD7, 9, 27).[4] He also found comparable ornaments at Sistan, *Innermost Asia*, pl. CXV in a find which

[1] As late as the seventh century in the Near East according to J. H. Iliffe, *Sigillata Wares*, p. 4

[2] Wheeler, Ghosh and Krishna Deva, *Arikamedu*, p. 22, 34 f. Arretine ware does not seem to have been found in appreciable quantities elsewhere in India (*ibid.*, p. 48)

[3] Marshall (*Taxila* II, p. 435) suggests that this ware is either *imported or made with the aid of imported dies or moulds*. He describes the Megarian, Arretine and Campanian wares as "second cousins" derived from a common Hellenistic parentage (*op. cit.*, II, p. 434, note 2). Whatever the case the Arretine ware obviously belongs to a later generation, even if the parentage is obvious

[4] Cf. also a bulb-like star on a sherd from Upper Swat, Stein, *Swat*, pl. 11:Ude 2.

he dates to the historical period preceding the Sassanian rule[1]. Ghirshman illustrates (*Bégram*, p. 69 and pl. XLIX) pottery stamped with rosettes, stars and leaf patterns which were found in the third city[2] (dated between 250 and the last quarter of the fourth cent. A.D.).[3]

It is hardly surprising to find the star and rosette motifs on the pottery decorated with very rich relief patterns from South East Iran.[4] A beaded pattern occurs frequently with the star, rosette and other motifs. The beaded line was used as a line of division on bowls or other vessels (pl. 69:7, 11), as a border (pl. 69:3), as a part of a design (pl. 69:5, 13) or it can even, if we can interpret the dots of pl. 69:12 as a beaded pattern, form the whole design.

Stein stresses the idea that the beaded ornament is firmly associated with Sassanian art and suggests that the pattern came to India during the pre-Mohammedan period, at a time when the art of North-West India was strongly influenced from Iran.[5] Ghirshman emphasizes the high esteem singled out by the Sassanian peoples for decoration in relief, as revealed by the toreutic treatment of their silver ware. This taste for relief ornament was brought to this country not by the Sassanians but by the Parthians who used it, for instance, in decorating their *terracotta* sarcophagi. Although we cannot tell what the origin of this taste was in Iran, we do know that bronze vases decorated with relief ornaments existed there before the Achaemenian period.[6]

It is not inherently unlikely that the moulded pottery, so suggestive of Roman *terra sigillata*, reached North-West India by way of Iran. With all reservations I would like to draw attention to the spouted fragment illustrated in pl. 69:14. The relief ornament of this piece, unclear though it may be, is very reminiscent of pottery with relief decoration from Iran[7]. The ornament below the border on the small fragment from Rang Mahal illustrated in pl. 69:3 (fig. 100:2) is unclear, but it is perhaps a damaged swastika (cf. Ghosh and Panigrahi, *Ahichchhatra*, fig. 8:15, 16) or a creeper (cf. Lal, *Hastinapura*, pl. XXXV:2, 6).

Glazed pottery

Except for the few fragments of bracelets, there were only two pieces of glazed pottery found in our excavation. It has however its correspondence from some few other places. Hilary Waddington, *Maholi*, mentions, in the chapter on pottery fragments from the site with a heavy turquoise blue glaze. The fragments in question are believed to represent at least three different finials and are dated to the Kushan period. In the temporary exhibition of recent finds, arranged by the Department of Archaeology in Government House in Dehli in 1955, a glazed potsherd from B. Sarans trial excavation in Muttra was exhibited. That fragment resembled closely ours Pl. 82:59 and was dated to the Kushan period.

[1] Stein, *Waziristan*, p. 9.

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Of the fifteen terraco[illegible] illustrated [illegible] example and the heads of the bowl illustrated in pl. 73, all were found [illegible] of trench I [illegible] which were found on the surface.

Pl. 71:1. Very crudely [illegible] figure with [illegible] male.

Pl. 71:2 and 3. Very cru[illegible] elled female [illegible] head and arms, probably female.

Pl. 71:4. Bust of crude [illegible] headless [illegible]

Pl. 71:6. Fragmentary [illegible] modelled male [illegible] the head is missing.

Pl. 71:5. Headless figure [illegible] a padded [illegible] seated on a cushion with legs crossed to the front. The fore-arms and han[illegible] the lap are [illegible] to a circular object, incised with a swastika; the spread fingers of the left [illegible] the other [illegible] This figure was found in trench I B 6; a somewhat smaller, but similar, figure [illegible] found in B [illegible]

Pl. 71:7. Right leg of a [illegible] male figure [illegible] appears to trail down his back to his calf. A scarf, squared at the top, falls [illegible] across the knee. A small female (?) figure peeps out from the left hand side of the [illegible] The head of [illegible] figure is circled by a nimbus or crown of projecting hair. This figure is the only [illegible] stone

Pl. 72:4. Headless male [illegible] sitting w[illegible] legs on a raised seat. The upper part of the body is naked, but fastened at the waist by means of a [illegible] is a knee-length striped tunic. A scarf decorated in the same manner as the belt passes from the left sh[illegible] over the chest to the middle of the belt. A short necklace of flattened beads is worn. Owing to the [illegible] impossible to say whether there are bangles on the upper arm.

Pl. 71:8. Male head with oblique bulging [illegible]-like eyes, the pupils of which are depicted clearly. The mouth, which is a mere slit, is surmounted by curl[illegible] moustaches. A form of turban can be seen on the back of the head.

Pl. 72:1. Male head with goat-like eyes [illegible] pils and sharply defined eyebrows. The turban on the head has a pronounced roll across the forehead.

Pl. 72:3. Male head with marked profile, oblique nose and pointed chin. The eyes are lenticular and have pierced pupils. A long plain moustache is depicted and a rolled turban is placed on the head.

Pl. 72:6. Male head. The applied eyes have pierced pupils. The mouth is indicated as open by means of a slit and is surmounted by small, curly moustaches. The turban on the head rises to a projecting top from which a band falls to the neck.

Pl. 72:2. Female head with lenticular eyes the pupils of which are represented in relief. The elongated ears are applied and a dot can be seen in the centre of her forehead.

Pl. 72:5. Female head with a dot in the centre of her forehead. The eyes are lenticular and no attempt has been made to represent the pupils. The chin is rounded and the hair is combed upwards.

Pl. 73. A round bowl placed on a low stand which serves as the base for two heads of high quality. The heads are exactly alike. The features are characteristically well executed with sharp noses and lenticular eyes, each with heavy, half-closed eyelids over the prominent pupils. The eyebrows are represented by a long row of small vertical incisions The lips are thick, the mouths are closed and the broad moustaches are reproduced as a row of oblique incisions The hair is arranged in close, carefully executed curls under a hood-like hat.

The left hand of one of the figures is stretched along the top of the bowl, while the right hand of the other figure is in a similar position

These figures were moulded and a single, exactly similar, example was found in I:B 6. This composite piece was found in trench I B 10. A fragment, having a hand similar to that described here, was found in B 8.

Parallels from other sites

Although small terracotta figures are common in many parts of Northern India[8], few of them can be related stylistically to the material from Rang Mahal.[9] Ahichchhatra and Ghosi, have however produced examples which bear some affinity to our figures.

[8] I am grateful for help received from Dr Agrawala Having seen photographs of the Rang Mahal figures he wrote (27 3 56) "corresponding sculptures to match these terracottas stylistically are extremely rare".

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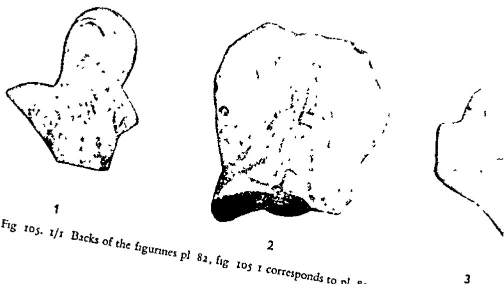


Fig 105. 1/1 Backs of the figurines pl 82, fig 105 1 corresponds to pl 82 64, 2 to 63 and 3 to 62

slantingly, a green branch (possibly a palm) The figure is broken at the base but it is clear that the left foot crosses the right The projecting grooved bulges on the back (one on either side of the loose dress) may be wings Cf the back of the figure, fig 105 2

The figure was probably seated on a cushion of the same green colour as the branch

Shri T N. Ramachandran, joint director general of Archaeology in India, who kindly has given his opinion after having seen a picture of the figurines, says about the piece in question "figure of a teacher or perceptor (*Acharya*) holding his hands in a pose of teaching or exposition A staff leans against his right shoulder The association of a staff precludes its identification as Buddha Probably an Acharya of Brahmanical faith was meant "

Head of a female figure, pl 82 64 of the same quality of faience as that just described A young person, with fine features, is portrayed The elongated eyes are painted black with a dot as a pupil while the eyebrows are formed of painted, hair-thin lines and the mouth is simply indicated by a black dot The brown hair can be seen on the forehead, peeping out from the hood-like hat The black vertical strokes inside the hood may indicate a trimming of fur [1] It appears that the hair was intended to emerge in a loop from under a hood at the back

Shri Ramachandran says "Head of perhaps a female mendicant (*Bhikshuni*) such as is described in Buddhist texts Note the arrangement of cloth over her head like a cowl " Cf fig 105 1

Small fragment of porcelain figure[2] pl 82 62 and fig 105 3. The object is badly worn The features of the face which is small have almost defaced, but they have not been painted as in the above examples Shri Ramachandran says "the torso is probably of a monk (*Bhikshu*)."

Shri Ramachandran makes the following general remarks about the three pieces "It is difficult to determine the dates of the above But the dress of the central figure, the association of a staff to indicate its status, may perhaps be viewed against the background of Brahmanical revival which had received a temporary setback with the growth of Buddhism The figure of the female mendicant with the cowl may just indicate the order of female votaries to the new-spring Brahmanical order. The Guptas and even the later Kushanas are known for their devotion to the new faith Perhaps we may not be wrong if we assign these antiquities to 4th—5th Centuries A D The material porcelain is contrary to the normal material, namely, sandstone, schist or granite etc. But by now

[1] Cf the similar representation of fur in J Barthoux, *Les fouilles de Hadda*, vol II, Paris 1930, pl 97 b, 98 e, 45

[2] A spectral analysis has been made in Febr 1956 by the kind interest of dr Nils Sundius at the Geological Survey of Sweden (by J Raudsepp) with the following result

SiO_2	64%	about 0 1% of Pb, Ni, Cr, Mn
Al_2O_3	21 »	0 1% of Ti, Cu
MgO	0,98%	traces of Sn, V, Co, B
CaO	1,0 »	
Na_2O	1,7 »	
K_2O	9,8 »	

India was having cultural intercourse with Central Asia, China and other countries that had imbibed Buddhism and Indian faiths. As such these were probably brought in or were made by foreign votaries to the new faith. This at once raises the question of the importance of Rang Mahal as an ancient place at the cross-road of cultures, where pilgrims, traders and students were assembling for their respective pursuits."

ANIMAL FIGURES IN TERRACOTTA

Animal-head mask. Pl. 75:1 illustrates a carefully executed animal-head mask, which portrays what is certainly a feline and probably a tiger. The large whiskers are executed in relief and stressed by means of a light cream coloured paint which has also been used to touch up the nose and eyebrows. Pl. 82:50 shows the colours.

This head was undoubtedly used as a mask: the interior, towards the wearer's face, is smooth. The eyes are pierced giving the wearer a wide field of vision. Holes in the remaining ear, the forehead and the lower part of the face were obviously used for fastening the mask to the wearers head with cords or straps. It was found in trench I B 6.

Animal Sculptures

Small clay models of animals must have been very popular at Rang Mahal. Some seventy examples, intact and fragmentary, were found on the site. They are all modelled by hand and most of them are of fired clay. The great majority were found in trench I in nearly all the levels from the top to A 13; one example was found in B 13, whilst thirteen examples from B 7 distinguish this level as the most productive.

It is most probable that these animals were generally used as toys, especially when they were provided with wheels. The women in the village from which our labour force was drawn make clay animals for their children to this day. But the fact that the *nandi* is a sacred animal perhaps invests these small sculptures with a deeper significance.

The *nandi* is the most frequently occurring model animal (pl. 74:1—7,20,24). One of the fragmentary *nandis* (pl. 74:12) has a hump so exaggerated that it resembles a wing more than anything else. The small animal depicted in pl. 74:9 is almost certainly a *nandi*, the damage behind the neck has presumably removed the hump. *Nandis* of cruder quality are illustrated in pl. 74:3,7,12 and 13.

One *nandi*, pl. 74:20, and another animal, pl. 74:26, have almost certainly been modelled to pull small carts as can be seen from the holes in the merged legs. The clumsy hip of the animal illustrated in pl. 74:21 may indicate a similar usage. Some animals are very formalized, for example the animal (pl. 74:17) from trench II, layer 11. On other occasions the sculptor has gone into greater detail (e.g. pl. 74:22) and depicted the tail and genitalia.

The models vary in size between 4.9 and 18 cms.

Occasionally the species of animal represented by these models are difficult to identify. The animal in pl. 74:16 for example has a band painted in black round the neck, over the back and under the tail, which may indicate harness. It is perhaps possible to identify it as a horse.

No complete camel survives, but the fragment found in trench II H 6, pl. 75:8, is a competent modelling by an artist of a camel's head with a bridle picked out in relief and black paint. Three very small camel heads are illustrated in pl. 75:5—7, two of them from trench I and the other from trench II. Ram's heads are illustrated in pl. 75:3 and 4, the latter example being most competently executed. Some of the animals mentioned above have applied eyes (pl. 75:3,4,6,7; pl. 74:6,9 and 12), two have applied tails (pl. 74:14 and 22), one applied genitalia (pl. 74:22) and three applied bridles (pl. 74:9 and pl. 75:5 and 8). A number are decorated with small circles (pl. 74:19), pin holes (pl. 74:17,18,20,26 and pl. 74:24) and a notch or *chakra* (pl. 74:25).

Finally, pl. 75:2 illustrates a small bird sitting on some sort of handle.

SMALL CLAY CARTS AND WHEELS

Only one definite cart is known (fig. 106). The object illustrated pl. 77:19 is perhaps a fragment of a cart; on the other hand it may merely have supported an animal. Wheels, of which about forty examples were found,



Fig 106 1/1 Toy-carriage I·A5

are simple and undecorated (pl. 76·1—8). In examples of good quality the nave is most competently executed (pl. 76·1) and in a few cases spokes are indicated (pl. 76·2,3 and 4). The wheels vary in size between 2.1 and 10 7 cms. in diameter. They are mostly made of fired clay and were most commonly found in trench I.

POTTER'S OR CLOTH-DYER'S STAMPS (?)

The objects which are shown in pl. 70 1—8 are tools of more or less unknown purpose although they are presumed to have been used for impressing patterns on pottery or for printing designs on textiles The first of these hypothetical uses seems unexceptionable as it is remarkable that these designs never occur on any of the vast quantities of sherds found at Rang Mahal If the objects were used as stamps for textiles it is strange that no traces of dye remain on them. Six specimens are known from trench I (B 9, B 13, B 14, B Pit 25 and A 9 and 10), one occurred in trench II·4 and four were found on the surface. Certain broken stands may perhaps have come from similar objects. The objects occur at all levels without any distinction.

Parallels from other sites

The potter's or cloth-dyer's stamps of the type illustrated in pl. 70 are paralleled on a number of sites. See, for example, Sharma, *Historical Sites*, fig. 4·IV.6 which belongs to period IV at Rupar; Marshall, *Bhita*, pl. XXX 67 illustrates an example from the Kushan period which is very similar to our pl. 70:6,7 and *ibid* pl XXX 90, which dates from the Gupta period. Another fragment from Jagatram, Kalsi in the Dehra Dun district was shown in a temporary exhibition at the National Museum in Delhi in September 1955.

MISCELLANEOUS CLAY OBJECTS

Weights (?) Illustrated in pl 76·14—19 are a series of small objects of which thirty-two examples are known from trench I, ten of which were found in I A·3 They measure 3×3×1 5 cms or 2 7×3×1.5 cms. The faces of all but four of the squares of clay are divided into four fields, in each of which are a series of three short lines or dashes, the other side is plain, except for three small dashes in the centre (pl. 76·14—15). One of the squares has three stripes in one field and two in each of the others (pl 76 18), the three stripes on the reverse face cover most of the surface. A small square, which measures 2 2×2 3×1 1 cms has three similar long lines on one side, the other side being left plain (pl. 76 19).

The surface of one carelessly made square is divided into six vertical fields each having three or four small dashes in the centre at right angles to the lines of division The reverse is decorated in the usual manner (pl. 76:17).

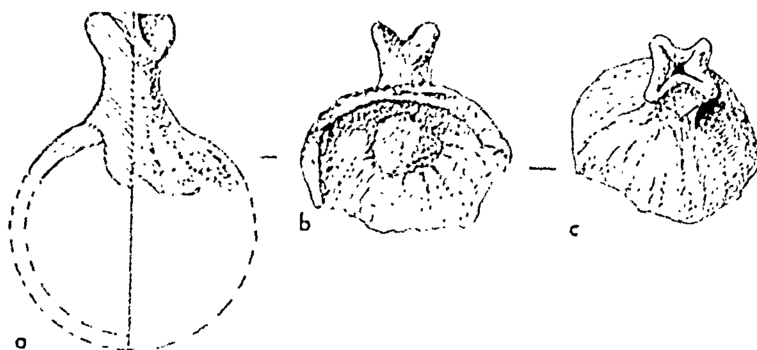


Fig. 107. 1/2. Rattle. (pl. 78:10) I:B8.

The face of another square, which measures 2.6×2.9×1.4 cms., is quartered, each field having its three dashes. The reverse has the usual three dashes (pl. 76:16).

All these variants are of burnt clay of grey-brown or pink colour.

It is possible that these objects were used as weights, although we can by no means be sure of this interpretation; squares with the same markings are of roughly the same weight (30 grams).

These square objects are paralleled on Bhita (Marshall, *Bhita*, Pl. XXVIII:125 and p. 80). Thirteen are square or rectangular and the rest are circular. All the square and rectangular examples are incised on one side with three parallel grooves; with two exceptions, the other side is plain. The exceptions are quartered by two lines, each subdivision also containing short incisions. Marshall interprets them as weights. They were found at all levels but most especially in the Gupta building.

Large balls, pl. 80:8b,c, probably used for crushing and grinding such things as spices. Several examples were found at various levels of trench I and II. The balls illustrated here came from I:B13 and B9.

Small Balls. About 150 small balls (toys) of fired clay were found at all levels of the excavation. They vary in diameter between 1.5 and 2.5 cms. They are mostly plain but a few have an incised pattern (pl. 78:5—9).

Miniature dagger of clay (pl. 81:23). This object is a toy.

Rattles, pl. 78:10 (fig. 107) and pl. 78:11. Although no complete rattle is known, comparison with complete objects in the Department of Archaeology at Delhi ascertain the correct identification of these fragments as parts of rattles. The fragment illustrated in pl. 78:10 is greyish in colour. Ten fragments of the same shape as that illustrated in pl. 78:11 are known from all levels of trench I. They are generally pinkish at the top and blackish at the bottom or *vice versa.*

Possibly fig. 82 represents an other type of rattle.

Openwork, fragment (fig. 108). This appears to be part of a disc-like object, perhaps an incense burner.

Irregular quadrilateral object. The object, which is almost rectangular in shape (fig. 109), has series of radiating incisions on both sides, which suggest grinding marks.

A rectangular object with concave sides and central hole is illustrated in pl. 76:13.

A rectangular object similar to that just quoted save that only one of the long sides is slightly concave. An attempt has been made to pierce the four corners of the object (pl. 76:12).

A rectangular object which ends in a roughly sculptured animal head is illustrated in pl. 77:20a. There is a groove along one side (cf. the two sections at A and B, drawn in pl. 77:20 b,c). Both the object and the groove must have been applied to some, now unknown, purpose. The fabric is black-greyish and the surface is smooth.

A rectangular object, similar to that just described, is illustrated in pl. 77:18.

A rectangular clay plate illustrated in pl. 76:9 has a central circular concavity. The plate has a wolf's-teeth ornament in relief along the edge, and on the adjoining sides are a series of oblique strokes, whilst the other two sides are



Fig 108 1/1 Openwork, fragment with red slip I B Pit 14



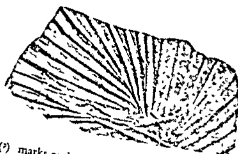


Fig 109 1/1 Object of clay with grinding(?) marks on both sides I A7

decorated with a herring-bone pattern. The base is divided into eight fields by three vertically and one horizontally incised line The object is of uncertain use, the central concavity however suggests a palette.

Small rectangular plate (pl 76 10) This has three concentric U-shaped grooves covering the face, each terminating in a small pit The object measures 6×4×1.9 cms. Some of our workmen suggested that it had a religious use for marking the forehead

Flesh-rubbers (pl 77 6,7) A few examples of these disc-like objects were found, in varying shapes, in trench I They are of pinkish colour and vary in diameter between 5 and 9 5 cms.

Flesh rubbers are known from other sites but few are published (cf. the square examples published by Lal, *Hastinapura*, pl. XLVII:4 and 5).

Discs with the edges slighly raised on one side, one of them decorated with oblique incisions is illustrated in fig. 110, the other in pl 77 8

They are very similar to some objects from Hastinapura, per. II (Lal, *Hastinapura*, pl. XLVI·1, 6 and 9).

Stopper (?) (fig. 111)

Small discs cut out from pot-sherds (pl 78 12) occurred at all levels of the site, especially in trench I Some eighty examples were collected The mean diameter is between 3 and 4 cms. but the diameters vary between 2 and 4 5 cms The use of these objects is unknown although the workmen suggested that they were used to cover the tobacco in the *hukkas* (water-pipes).

Square plate, (pl. 80 8a) of very fine-grained, smooth clay II:4[2].

Square, low stand with four feet (pl 80 2) Two fragments of these types were found on the surface of the mound However the fragments do not come from the same object



Fig. 110. 1/1. Disc of clay. II:4[2].

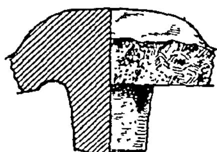


Fig. 111. 1/1. Stopper (?) of clay. I:B8.

Large, flat handled object, (pl. 80:6), which may have been used as a dabber for packing. It is made of very coarse clay which was mixed with husks. II:1.
Konoras (pl. 80:9—10) used for patting the bases of pots while the clay is wet. I have myself seen the potters of Suratgarh use the same type of object; the "konora" is held with the left hand against the inside of the base, while the walls of the pot are slowly beaten externally with a wooden object, looking like a table-tennis bat, held in the right hand. "The hole at the top (of the 'konora') is for insertion of a crooked stick, when the pot is too deep for the arm to reach the bottom."[1] Nine examples were found at varying levels of trench I.

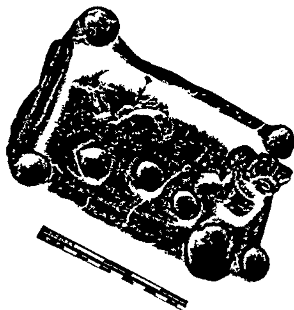
Cf. Marshall, *Taxila*, II, p. 502. The "konoras" illustrated by Marshall (in pottery, *op. cit.*, III, pl. 129:s and stone pl. 142:q) are of the same shape as those illustrated here. Marshall considers that the objects used for beating the outside of the pot ("thatwas") were usually made of wood. He illustrates some made of stone of a hammerlike shape (*op. cit.* pl. 146: 127a, 128). "Konoras" have also been found elsewhere, e.g. at Hastinapura (Lal, *op. cit.* pl. XLVII, 1—3) and Bhita (Marshall, *Bhita*, pl. XXX:66).

Solid clay dice (pl. 76:11). The dice are numbered from one to six with the appropriate number of circles. They were found in trench I, four in the upper levels and one deeper down. They measure 1.8 × 1.8 × 1.8 cms. and 2 × 2 × 2 cms.

DECORATED FIRED BRICKS.

Pl. 79:1. Brick with acanthus-leaf ornament. Bricks of this type apparently formed the topmost course of the outer face of a wall. Two of these bricks were found in the loose upper layer above the southern face of H7aW (cf. p. 86).
Pl. 79:2. Fragment of decorated brick similar to that described above. Examples were found in II:13, H9, H9[3] and I:A1.
Pl. 79:3. Corner-stone of a brick wall or plinth, the angle being formed of acanthus-leaves. II:12.
Pl. 79:4. Similar to the above. S.
Pl. 79:5. Brick, used in a similar manner to those illustrated in pl. 79:1 and 2. S.
Pl. 79:6. Fragment of a brick. The deep grooves at the base give the brick a certain resemblance to that illustrated in pl. 79:3. Similar fragments were found in II:7[1], 12, 16[2] and I:A5.

[1] Marshall, *Taxila*, II, p. 424.




a b

Fig 112 Terracotta objects from Ahichchhatra a Votivtank, b about 1/2 Hollow plaque, showing on the front side "a male figure with his legs terminating in the open jaws of two fishtailed crocodiles, a motif familiar in the art of Mathura" After Agrawala, *Ahichchhatra*, pl XXXVIII and LVII 262

Pl 79 7 Squat brick decorated with rows of small, closely packed, acanthus-leaves S
Pl 79 8 Brick decorated with a zig-zag pattern. S
Pl. 79 9 Brick, the outer face of which is decorated with a chequer pattern S
Pl. 79 10. Similar to the above. II 15. (cf. p. 84) Bricks of this kind (pl 79 9, 10) were also found in II 11, 13, H8 The same type of brick is manufactured to this day in a kiln outside Suratgarh on the road leading to Rang Mahal.
Pl 80:1. Brick decorated with acanthus-leaves tied together with ribbons This brick may originally have come from the frame of a relief similar to that illustrated in fig 125·3. On the other hand it may have come from a position similar to that held by the brick pl. 79 1 S.
Pl 80.3 Fragmentary tile with a carved, rosette-like ornament S
Pl 80 7. Large, square, coarse brick decorated with three parallel grooves The grooves were executed with a finger which dug more deeply at the beginning of each groove The brick is presumably a cult object (cf pl 76.10) I 11.

DRAIN-PIPES

Three contiguous fragments of a cylindrical drain-pipe (diameter 17 cms.) were found in I B4; another fragment, which did not link up with the other three, was found in B Pit 17 (this pit finishes in B4). Still another such fragment was found in I A9

A fragment, 8 5 cms long and 8 cms. in diameter found in I B10, presumably served the same purpose.
Pl. 80.4 A cylindrical, tapering object from I B8 may also be a drain-pipe.

VOTIVE TANKS.

Pl 80·5 Fragment of the corner of a square votive tank; there is a lamp on the corner. This piece is evidently the fragment of a tank of the same type as those found in Ahichchhatra (our fig 112a)[1], Hastinapura[2] and Taxila[3].

[1] Agrawala dates the first occurrence of the votive tank in Ahichchhatra to 100—200 A D

[2] Lal, *Hastinapura*, p 87

[3] Marshall, *Taxila*, III, pl 136 133 f, II, p 463 f

The votive tank is believed to be connected with the cult of the mother goddess.[1] The fragment figured here was found in I:B5, fragments of similar tanks were found in B9 and B11.

PERSONAL ORNAMENTS OF CLAY[2]

Pendants (pl. 78:1—3). The most frequent type is a long, conical pendant with a hole for suspension. With the exception of the pendant illustrated in pl. 78:1 they are very carelessly made, often of unburnt clay. The sides are straight and the base is sometimes expanded and rounded. They vary in size and possibly represent the *lingam*, used as amulets. Some are not pierced. About twenty examples were found, they occurred at all levels of the site.

Fire pendants figured in pl. 77:12—16 are of an interesting type: they are pierced from two directions at right angles. Six examples were found at varying levels. They were all made of a fired greyish or brownish clay. The example illustrated in pl. 77:13 is especially interesting: the incised patterns on three sides may be of symbolic significance and it seems likely that the trident represents the symbol of Siva. The unique pendant illustrated in pl. 77:12 is large and badly made.

Conical pendants of the type illustrated pl. 78:2 can be compared to unstratified examples from Hastinapura (Lal, *loc. cit.* pl. LVI:46).

Small triangular object. This object (pl. 78:4) has concave sides and a rounded base with a bifurcated incision. Although the object is not pierced for suspension it was possibly intended as a pendant.

Oblong object (pl. 77:15). This object is grooved at each end and was possibly intended for suspension.

Ear-ornaments. The reel-shaped ornament pl. 77:1—5,9—11 occur on sculptures of the period as ear-ornaments (cf. fig. 113). The edges are sometimes concave and the ornaments are made of both fired and unfired clay. They vary in diameter between 1,7 and 6 cms. and in height between 1 and 2 cms. Burnt and unburnt examples are found. They are mostly unornamented but are occasionally decorated with small strokes or grooves. Some hundred and fifty examples were found from all levels of the excavation.

The reel-like objects illustrated in pl. 77 and which I have interpreted as ear ornaments, occur in many places in various materials. For instance they are "very commonly found" at Rairh, where they are made of bronze, lead, rock-crystal, glass and pottery, some of them could even have been covered by thin gold sheeting (Puri, *loc. cit.* p. 41 f. and pl. XXI:1, 5, 7, one of which is decorated with concentric circles like our pl. 77:4). A steatite example from Hastinapura (Lal, *Hastinapura*, pl. L:9) is described by Lal as a "chessman or perhaps ear ornament." Two other stone-objects (one of red jasper) of about the same shape he labels as weights (*Hastinapura*, pl. L:5,11 and p. 90).

BEADS

Altogether 132 beads were found in the two trenches. Of these, 85 are of clay, one of them covered with a thin coating of bronze, 13 of carnelian, 13 of glass and paste, 9 of shell, 2 of coral, 2 of quartz, 1 of a molten porcelain substance, one is a pierced stone and one a pierced fruit-stone. Of the following more or less precious stones there is one ruby, one amethyst, one agate and one lapis lazuli.[3]

[1] Agrawala, *loc. cit.* p. 125, believes that this type was introduced in India under Parthian influence. Marshall, *op. cit.* II, p. 467, on the other hand considers this unlikely, instancing the fact that the idols, occasionally found together with tanks, are of an old purely Indian type. He does not, however, deny the possibility of a common prototype at a much earlier date.

[2] The beads of clay are described below, p. 166, together with other beads.

[3] The determination of the material of the beads shown in pl. 82:2—35 has been kindly made by assistant professor Pontus Ljunggren at the Mineralogical Institute of Lund University. The beads pl. 82:36—44 were determined by Y. Löwegren, superintendent of the zoological museum of Lund University.

Fig. 113. Sculpture of a man with ear-ornaments. Sarnath Mus. After Bachhofer, *Fruhindische Plastik*, Taf. 12.

Clay beads. The simplest type of bead is globular and rather uneven in shape, examples vary in diameter between 1.1 cms and 2.8 cms. A single grooved, or melon-shaped, bead of good quality is illustrated in pl. 81 5. Altogether some forty-two globular beads were excavated. The wine-red oval bead (pl. 81·1) is unique. The next most common form is the standard pear-shaped bead or bead of truncated, conical shape with a groove near, or just under, the slightly concave base (pl. 81·6—11), they are usually brown or black in colour and occasionally finely polished. Their basal diameter varies between 2 and 2.7 cms. Some thirty-six examples of this type were found at all levels. A few flat beads also occur (pl. 81 12, right). The vase-shaped type (pl. 81 2—4) occurs in the upper and middle layers. Only a few examples are known.

Pl. 82.1. *Clay bead covered with a thin coating of bronze.* This round bead is unique of its kind. I:Av3.

Carnelian beads. Of the 13 carnelian beads two are *etched beads*. They all belong to Dikshit's[1] type I, i.e. they have a white ornament etched on the natural red surface.

Pl. 82·2 is in the shape of a double pyramid with a white etched line round each hole and two parallel lines round the middle of the bead, separated by a row of small white etched dots (I A7).

Pl. 82:3 is a rounded, facetted bead with etched white lines forming irregular fields on either side of the bead, each one having a white cross in the centre (I B7).

Pl. 82 4 is a tubular bead of carnelian (I.A10).

Pl. 82·9. A small oval bead of carnelian (I A10).

[1] *Etched beads in India* gives a highly detailed description and list of the etched beads in India, known up to the year 1949, with comparisons drawn in rega[illegible] [illegible]. See the list of types on p. 10.

Pl. 82:5—8, 10—14. Carnelian beads of more or less spherical or slightly tubular shape; they belong to various strata av I, while four come from II:A.
Pl. 82:15—16. Two *coral* beads insignificant in size and of indeterminate shape (I:A9, A11).
Pl. 82:12. The *agate* bead is more probably a droplike pendant (I:B Pit 25).
Pl. 82:18. An *amethyst* bead, rhombic and flattened (I:A^{v}3).
Pl. 82:19. A beautiful bright-red *ruby* bead of indefinite form (I:B12).

Pl. 82:20, fig. 114, Melon-shaped *lapis lazuli* bead. II:2A[1]. 

Pl. 82:21—22. Two beads of *quartz* differing greatly in size, the larger one globular, the smaller one of irregular shape (I:B 11 and B 10).
Pl. 82:23. A bead of a *porcelain-like substance*, tubular in shape (I:B 1).

Paste beads:
Pl. 82:24. A small tubular dark-red bead (II:2 A[1]).
Pl. 82:25. Half of a tubular bright-red bead (II:H8).
Pl. 82:26. A bluish-green tubular bead (I:A^{v}7).
Pl. 82:27. An oval bead with a flash; it contains oval-lanceolate, slightly arched fields. The superficial layer has partially disappeared (I:A^{v}3).

Glass beads.
Pl. 82:28. A small yellowish-green, round glass bead with flash; possibly it has been covered with gold foil. It has a fine edge (I:A^{v}3).
Pl. 82:29—35. Round beads of bluish-green glass (one from II:H 8, the others from II:1).
Pl. 82:47. A narrow tubular bead of bluish-green glass (I:B Pit 25).

Beads of polished shell.
Pl. 82:36. A disc-shaped bead. I:A14.
Pl. 82:37—44. Round beads (found at different strata of I and in II:1).
Pl. 82:45. A bead made of *stone*. I:A7.
Pl. 82:46. A drilled fruit-stone, used as a bead. II:1.

Pl. 82:48. The polished *rock-crystal fragment* may possibly have been intended as a bead but is not drilled; it may have been broken on an attempt to drill it. II:H7[1].
Pl. 82:49 reproduces a bright-blue *glass marble* ornamented with four parallel, slightly curved lines (running at equal intervals from one another). II:VI.

Parallels from other sites

Terracotta beads in the shape of small pots (pl. 81:2—4) occur on a number of sites. Dikshit (*Ahichchhatra*, pl. XIII:130) illustrates some and (p. 63) describes them as "Ghata-shaped beads" quoting parallels from Kausambi (where they are found at all levels between 500 B.C. and 200 A.D., but most commonly in the period 100 B.C. — 100 A.D.), Bhita, Chirayya, Kot, Ujjain, Masaon, Dih, Taxila, Peshawar and Tripuri (in all levels dated *circa* 200 A.D.). To these sites can be added Purana Qila, New Delhi[1], Hastinapura (Lal, *loc. cit.*, pl. LVI:42, from an early level of period III and, unstratified, pl. LVI:43) and Rairh, (Puri, *loc. cit.*, pl. XXII:38).

Truncated conical beads of the type illustrated in pl. 81:6—12 are similar to examples found in periods III, IV and V at Hastinapura (Lal, *loc. cit.* pl. LVI:34, 32 and 35 and 33), they also occur

[1] Department of Archaeology's temporary exhibition of finds from new diggings held at Government House in Delhi Sept. 1955.

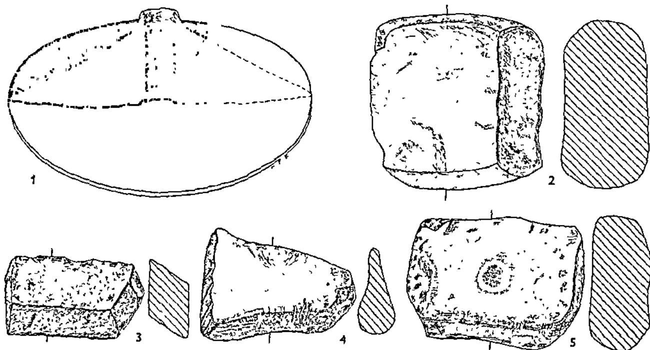


Fig 115 1/2 Stone-objects 1) grinding mill, 2, 5) mullers, 3, 4) whetstones
1) I B Pit 25, 2) I B14, 3) I B6, 4) I B Pit 25, 5) I·B Pit 25

at Rairh (Puri, *loc cit.*, pl. XXII·37) and at Purana Qila.[1] An example of "rare shape" and of coarse fabric with a yellowish slip from Ahichchhatra (Dikshit, *loc. cit.* pl. XIII B.132) can be compared with an example from Rang Mahal (pl. 81:12) The bead illustrated in pl. 81·5 is similar to an example from period IV at Hastinapura (Lal, *loc. cit.* pl. LVI.39).

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The melon-shaped lapis lazuli bead, fig. 114, the type of which is known from widely separate ages and districts both inside and outside India[2], may appropriately be compared with the "Amalaka"-shaped faience beads referred to by Dikshit and illustrated by him from Ahichchhatra (Stratum III, A.D. 350—750).[3]

BANGLES OF GLASS

Pl 82·60 Fragment of facetted *bracelet* of blue glass II:7A.
Pl. 82.61 Fragment of a thin *bracelet* of black glass, consisting of a thin twisted rod I Av6

[1] Cf the preceding note
[2] As instances may be mentioned Greek and Roman times and also the Nordic Viking Era
[3] Dikshit, *Beads from Ahichchhatra*, figs 4·87 88 and p 51 Cf also Sankalia and Dikshit, *Brahmapuri*, pl XXV A

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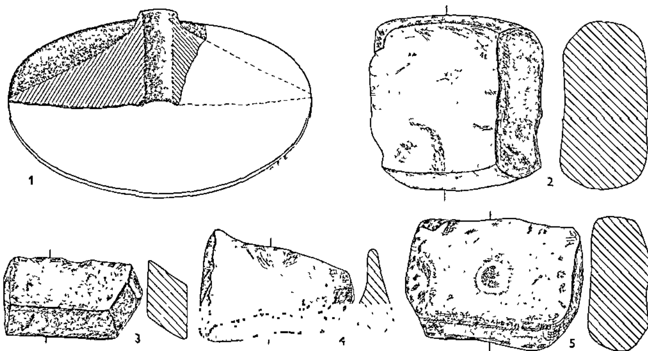


Fig 115 1/2 Stone-objects 1) grinding mill, 2, 5) mullers, 3, 4) whetstones
1) I B Pit 25, 2) I B14, 3) I B6, 4) I B Pit 25, 5) I B Pit 25

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Pl. 82·60 Fragment of facetted *bracelet* of blue glass II.7A
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STONE OBJECTS.

Hand-mills or mortars. One natural, somewhat hollow stone from the uppermost layer of I:A has possibly served as a kind of hand-mill.

Fig. 115:1 is one quarter of the rotating stone of a *grinding-mill* of red sandstone. I:B Pit 25.

A square sandstone in I:B14 with a round cavity has possibly served as a kind of mortar or pivot-stone for the potter's wheel.

Fig. 115:2, 5 are *mullers.* Stones of quartzite or other hard kinds of stone, they have certainly been used for grinding grain or crushing harder substances on slabquerns. Such stones of somewhat the same shape are found in trench I:A2, A13, A Pit 10, $A^{v}4$, B2, B4, B7 (2 copies), B8 (5 copies), B9, B10, B14 and B Pit 14, Pit 25; in trench II:15, H 7 a^{3} (2 copies).

Pl. 80:11b is a ball-shaped stone which has certainly been a sort of *pestle* or anyhow used for crushing, as one side shows very plain traces of friction. I:B Pit 17.

Pl. 80:11a is a partly polished stone of indistinct shape showing traces of the same sort of friction as pl. 80:11b and has certainly been used in the same way. I:B Pit 14.

Fig. 115:3,4 are *whetstones of sandstone*; such stones are found in trench I:A^{v} 1 (2 copies), A^{v} 3 (3 copies), $A^{v}4$, $A^{v}8$, B6, B Pit 17 and 25. trench II:5.

BONE OBJECTS.

Fragment of *rectangular bone die.* I:B10.

Pl. 81:18. Astragalus, probably used as die, cf. p. 197. Examples were found in I:A5, $A^{v}5$, A10, A11, B9, B Pit 25.

METAL OBJECTS.

No objects of precious metal have been found in Rang Mahal. Bronze and iron objects are relatively few.

Objects of bronze.

Pl. 83:1. *The handle of a bell,* probably used for a religious purpose. The handle is crowned with the god-bird, the Garuda, associated with both Indra and Vishnu and Krishna (I:A5).

Pl. 83:2. *Bracelet* for a small child's arm. The upper surface is obliquely fluted, as if the bracelet were made of a twisted bronze rod, but the under surface is smooth (I:A14).

Pl. 83:5. Fragment of a *bracelet,* along the middle of which runs an elevated fluted band (II:III). An entirely unornamented *ring-shaped bent bronze band* of the same width as the preceding also appears to be a fragment of a bracelet.

Pl. 83:4. Fragment of a *finger ring,* the upper surface of which is adorned with a soldered-on rectangular bronze plate with a slightly raised edge, in which a stone or other ornament may have been inset (I:B8).

Pl. 83:7. *Ring,* evidently for a pendant (I:B10).

Pl. 83:6. *Mounting,* ring-shaped, of a relatively broad bronze band but of very small diameter (I:B11).

Pl. 83:10. *Clasp* (I:A10).

Pl. 83:11. *Mounting,* consisting of a horse-shoe shaped, bent bronze band, the two ends of which are rolled out to form a ring. (I:A14)

Pl. 83:3. Part of a *band-shaped mounting,* which has been bent into a circle, possibly to encircle a wooden vessel (II:$H4^{2}$).

Pl. 83:8. *Handle*(?) for a vessel. The object is broken off at its wide middle part. The other end is twisted into a knot (II:$H4^{2}$).

Pl. 83:9. *Pin* (I:$A^{V}3$).

Further, indeterminable small bronze fragments were found at various depths in about ten places in trench I and in five places in trench II.

Objects of Iron.

The iron objects are somewhat more numerous than the bronzes, although they too are fairly few.

Pl 84:1. An iron *ladle* (II:H3[2]).

Pl. 84:2,3. *Handles* for vessels, which may have been of wood, are found in three or four cases (I:B12).

Pl. 84:4,5. *Sockets*, ending in a loop, probably of a wooden object of some kind. Both found in II:H7.

Pl. 84:7. *Mounting* (II·H5[2]).

Pl. 85:15. *Mounting*, evidently deriving from a round wooden vessel (I.B7).

Pl. 84:9. *Ring*. (II:H:6[3]).

Pl. 85:13. Ring-shaped *mounting* (II:H3).

Pl. 85:6,8. There are two examples of *sickles*, both found outside the house in trench II

Pl. 85:2—6. *Arrow-heads*, which represent the entire number of such objects found in trenches I and II Pl. 85·3 with flat rhomboidal blade is provided with a sheath; figs. 4—6 have a tang, figs. 4 and 6 have a thicker and fig. 5 a more lancet-like blade Pl. 85·2 reproduces a short arrow-head on the tang of which there are still remnants of wood (I:A6, I·B14, II 2A, I:B12, I·A[v]6)

Pl. 85:1,7,8. A *spear-head and sockets of two such weapons*. Pl. 85:7 has had a wing-like process projecting down over the sheath (I·A11, A[v]8, B Pit 25).

Pl. 85:12. A small *bowl* or mug (I.A10)

Pl 85:10. A small *bell* (I.B11).

Pl. 85:11. A large *hook* (I B7)

For the rest, there have come from various strata fragments of nails and rivets — an entire *rivet* is illustrated in Pl. 85:14 — and also lumps of rust of an indefinable kind



Fig 110 1/1 Kanishka III coin After Bachhofer, fig. 8

COINS

All the hundred and five coins found during the excavations at Rang Mahal were of copper. Eighty-two of them were found in RM I and twenty-three in RM II.

Two pieces not included in this total may be fragments of coins. Thirtyfive coins were found on the surface[1], the few determinable of them, and two found in the neighbouring tank, will also be discussed here.

I would like to express my thanks to Mr A. D. H. Bivar of the Heberden Coin Room of the Ashmolean Museum, Oxford, who examined the coins and to Mr. G. O. Matsson, of the Royal Coin Cabinet in the State Historical Museum, Stockholm, who made the first list of the coins and with whom I have discussed various numismatic problems.

Mr. Bivar was able to identify positively 53 of the 112 coins, he further tentatively identified another eight. Most of the coins were in poor condition and many of them had disintegrated considerably or lost many of their symbols. The poor condition of the coins is, as Mr. Bivar

[1] It might be added here that, in the earlier stages of the excavation, we were often offered coins which the villagers said had been found on the mound They were often defaced and we had to restrain the village children from digging in the mound for coins for which they hoped to get "bakshish".

pointed out, but one difficulty: another important consideration to be born *in mind*, when studying the chronological implications of coins found in Indian settlements, "is the fact that small copper denominations in India have at many periods been issued, not by the central Government of the day but by innumerable local authorities. Although the number of types commonly found in any given area are quite small, the variety for the whole country is immense. Even the fullest catalogues are by no means complete and intensive collection on any site is almost certain to produce varieties that cannot be paralleled from the catalogues." Mr. Bivar forestalls any criticism of this failure to identify uncatalogued examples among the Rang Mahal coins by saying that "it is possible that among the poorer specimens are examples of uncatalogued coins, but this can only be established when better specimens come to hand." He adds that "it is notorious that in India old copper coins continued to circulate for a thousand years or more after the date of issue."

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The position of the coins in the various levels of the excavation can be seen in the table VII below. The distribution confirms Mr. Bivar's observation concerning their long period of circulation: earlier and later coins are mixed in a manner which is most disturbing from the chronological point of view. So, for example, we find punch-marked coins in trench I: $A^{v}3$ and II 4^{2} (pl. 86 35 and 39), coins from Kanishka I occur in trenches I A 4 and B 6 (pl. 86.3 and 1), while coins from Kanishka III occur in I:B 13 (pl. 86:13) and even in I B 14 (i.e. the bottom level of trench I). One coin dated between 1210 and 1235 A.D., and struck for an unidentified ruler of Medieval Rajputana (Mewar (?), cf. W. W. Webb, *The Currences of Rajputana*, London 1893) was found in II:1.[1]

The only chronological conclusions to be drawn from the coins is that the oldest levels cannot be older than the latest coin found there; which is after all an important enough conclusion.

It could perhaps be argued that in my discussion of the different types of coins and in their reproduction on pl. 86 I should have started with the punch-marked, or uninscribed, coins as they are the most ancient type. However, as their attribution is doubtful, I have chosen to start with Kushan coins.

Pl 86:1. Kanishka I Obv king standing left, leaning against his lance, right hand on altar, left arm crooked, he is clothed in a typical knee-length coat (cf INC, I, pl. XII 3) Rev the wind god running to the left with both hands raised Inscription in Greek OAAO — Oado or Vado, "the wind"[2] (cf. IMC, I, pl XII 4, PMCI $\frac{189}{83}$) I B6

Pl 86:2 Kanishka I Obv as above Rev goddess, right, holding sceptre in uplifted hands Inscription NANAIA — to the right is the device of the Kushana kings, cf PMC, I, p 217, Monogram and marks, Kushan, no 4 (cf IMC, I, pl XII 3 and PMC, I, 186) S

Pl 86 3 Kanishka I Obv as above Rev defaced I A4

Pl 86 4 Huvishka Obv king full face, reclining crosslegged on couch[3], holding sceptre in uplifted left hand, right hand on hip Rev. god of metals[4] or Sungod[5] to left MIIPO (cf IMC, I, pl. XIII 5 and 6 PMC, I, 202) I A4

[1] Coins of various periods were found on the surface of the mound one struck for Ala-ud-din Muhammed, Sultan of Delhi (cf Wright, 359), two coins struck for Akbar (one of which is figured in pl 86 41), one coin of Aurungzeb or Muhammed Shah, two of Ratan Singh of Bikaner (1828—51), one coin was a local Indian issue of nineteenth century date and another was one of Queen Victoria

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Pl 86 2 Kanishka I Obv as above Rev goddess, right, holding sceptre in uplifted hands Inscription· NANAIA — to the right is the device of the Kushana kings, cf PMC, I, p 217, Monogram and marks, Kushan, no. 4. (cf. IMC, I, pl XII 3 and PMC, I, 186) S

Pl 86 3 Kanishka I Obv as above Rev defaced I A4

Pl 86.4 Huvishka Obv king full face, reclining crosslegged on couch[3], holding sceptre in uplifted left hand, right hand on hip Rev. god of metals[4] or Sungod[5] to left MIIPO (cf. IMC, I, pl XIII:5 and 6 PMC, I, 202). I:A4

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[4] According IMC, *l c*

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Pl. 86:5. Huvishka. Obv. king full face, reclining. Rev.?. Perhaps MIIPO (cf. PMC, p. 202). I:B9.
Pl. 86:6. Huvishka. Obv. completely defaced. Rev. god as no. 4. MIIPO, to the left is the device of the Kushana kings. I:A5.
Pl. 86:7. Huvishka. Obv. king squatting. Rev. completely defaced. Perhaps MAO. (cf. PMC, I, p. 204.) S.
Pl. 86:8. Vasudeva I. Obv. king standing with right hand over altar; uplifted left hand crooked and holding a trident.[1] Rev. two armed Siva, standing full face, noose in right, trident in left hand.[2] A bull stands behind OHPO (cf. IMC, I, pl. XIII:8—9 and PMC $\frac{209}{216}$). II:4.
Pl. 86:9. Vasudeva. Corroded. Obv. as above. Rev. completely defaced. S.
Pl. 86:10. Vasudeva or copy of Vasudeva. cf. above Rough specimen. S.
Pl. 86:11. Vasudeva. Much corroded. Obv. completely defaced. Rev. as no. 8. I:B13.
Pl. 86:12. Kanishka III, Kanisko. Obv. king standing at altar. The coat of the king, as is usual on coins of Kanishka III, hangs down in a fold on either side. Rev. goddess enthroned, certainly Ardoxšo (cf. PMC, I, $\frac{210}{228}$). Tank.
Pl. 86:13. Kanishka III. As above. I:B13.
Pl. 86:14. Kanishka III. Obv. as above. Rev. completely defaced. S.
Pl. 86:15. Kanishka III. Obv. as above. Rev. goddess as above, cornupiae in her left hand, to left a ladder-like design, which certainly is a blundered inscription, cf. our fig. 116[3] (on this coin the goddess is holding her feet on a round carpet, this is repeated on the coin at present under discussion). I:B8.
Pl. 86:16. Kanishka III. Obv. quite defaced. Rev. goddess as nos. 12 and 13. I:B11.
Pl. 86:17. Copy of Kanishka III coin, cf. coins above. As is typical for portraits of Kushana kings, the king is nimbed (cf. fig. 116), the nimbus is sometimes as here only represented on the left hand side (cf. IMC, I, pl. XIX: 210, 211, 216). I:B10.
Pl. 86:18. Murunda. Obv. standing king as above. Rev. presumably meant to be the same as on the coins described above the portrait of the goddess has, however, been misunderstood. The tank.
Pl. 86:19. Murunda. Obv. Standing king as coins above. Rev. defaced. I:A^v4.
Pl. 86:20. Murunda as above. I:A^v6.
Pl. 86:21. Murunda. Standing king, type uncertain. Obv. quite defaced. I:A 11.
Pl. 86:22. Murunda. Obv. Standing king as nos. 12—20. Rev. a blundered representation of the same goddess as on the coins above. (Bivar remarks that this is possibly a new reverse). I:A^v6.
Pl. 86:23. Murunda. Bivar says that it is an unfamiliar small variety. Obv. Standing king (cf. no. 21) Rev. is certainly the blundered representation of the same goddess as on the coins above. I:A^v6.
Pl. 86:24. Murunda. Obv. Standing king as above. Rev. defective figure of seated goddess. II:4.
Pl. 86:25. Murunda. Obv. standing king as coins above. Rev. completely defaced. I:B 12.
Pl. 86:26. Uncertain.[4] I:B 8.
Pl. 86:27. Not determined. One side completely defaced, the other filled with a wheel surrounded by a beaded ring.[5] I:A^v4.
Pl. 86:28. Not determined. Obv. small standing figure. I:B 12.
Pl. 86:29. Not determined. One side shows traces of signs or, possibly, letters: the other side is completely defaced. II:I.
Pl. 86:30. Not determined. I:A 8.
Pl. 86:31. Not determined. Probably (according to Matsson) punch-marked. I:A^v3.

[1] Vasudevas coins invariably show the king standing in an attitude which closely resembles that of Kanishka I, PMC, I, p. 175.
[2] Vasudeva coins figures only the goddesses NANA and Ardoxšo and the Indian god Oesho or Siva, PMC, I, p. 175.
[3] This goddess was especially beloved of the Buddhists of northwest India.
[4] Bivar states "uncertain, perhaps Chandragupta II" referring to BMC (Gupta) $\frac{54}{148}$. I cannot see the resemblance.
[5] Matsson refers to Taxila BMC (Ancient India) p. 216, nos. 11—16. The wheel on our no. 27 resembles that on the square Taxila coins (ibid. pl. XXXI:11—16).

TABLE VII

The occurrence of coins in the different layers

Punch-marked	Kanishka I	Huvishka	Vasudeva	Kushan	Kanishka III	Murundas	Taxila and other ancient Indian coins	unidentified
I ?A4	S	S	S(2)	?B 12	S	S	I ?B12	I A1
?$A^{V}3$	I·A4	I·A4	I B13		Tank	Tank	?B13	A4
B9	B6	A5	II 4		I $A^{V}3$	I $A^{V}2$	II 1	A8
?B9		B9			B8	$A^{V}4$(2)		A10(3)
?B13					B11	$A^{V}6$(2)		$A^{V}3$(4)
II 4					B11 (copy)	A7		$A^{V}4$(3)
?6					B12	B8		B8
					B13	B10		B9(12)
					B14(2)	B11(2)		B10(3)
						B12		B11(3)
						B13		B12(2)
						II 1		B13(8)
						4		B14
								B, Pit 25
								II 1(3)
								2A(2)
								3
								4
								6
								8
								$H7^{1}$(4)
								I(3)
								III

Pl. 86 32 Not determined Obv animal (?). Rev completely defaced I A 10

Pl 86.33 Uncertain [1] I B9.

Pl. 86 34 Punch-marked? I B9 [2]

Pl 86·35. Punch-marked(?) I $A^{V}3$

Pl. 86.36 Punch-marked? I A4

Pl. 86 37. Undetermined II 1

Pl. 86·38. Undetermined. I B9

Pl. 86·39 Punch-marked II 4[3].

Pl. 86 40 Tribal coin I B13 [4]

Pl 86·41. Akbar From Moslem grave 1 (cf. p 185)

[1] Bivar says: "Possibly Hephalite Ca 500 A D Sarada letters(?) The coin is very defaced and seems to me very uncertain"

[2] Bivar has left 34, 36—38 undetermined, Matsson labels 34, 36, 40 as punch-marked

[3] Determined by Bivar.

[4] Bivar says "as known amongst the 2nd cent B.C. Tribal issues, e g from Taxila, but not published This specimen anyway quite uncertain"

INSCRIBED CLAY-TABLET

Pl. 81:20 shows a fragment of a clay tablet with a fragmentary inscription in Brāhmīscript. Shri T. N. Ramachandran, who has kindly studied a photograph of the tablet, transcribes the text:[1]

1 ta ta śa (or jā) kā kā la [ti]
2 taḥ pra (or 4) khyā (or 100)
3 *mva* ta [ri] va
4 *pri yē ti*
5 bhī (or ṇī) tāḥ

He says further: "The script of the inscription may be referred to about the 7th century A.D. It bears close resemblance to the early rock inscriptions from the Chamba State (Antiquities of Chamba, Part I, p. 137, Plate VI). It seems likely that the script of the inscription is a precursor of the Śāradā and the Tibetan scripts of the Himālayan regions.

The language of the record is corrupt Sanskrit. The Śaka year seems to be mentioned in line 1. If so the letters read as *ta ta sā* in line 1 may stand for 775. But this date seems to be rather too late for the characters of the record which are at least a century and a half earlier. The letters *pra* and *khyā* in line 2 may likewise be taken as numerals for 4 and 100 respectively. But in this case, if 400 is intended, the sign for 100 must come first and that for 4 next which is not so here.

The object of the inscription is not clear. The ends of lines 2, 3 and 4 seem to be lost in the broken part. Consequently lines 2 to 5 do not read continuously."

As I also had the opportunity to show a photograph of the tablet to dr. phil. Siegfried Lienhard, a Sanskrit-scholar from Goettingen, Germany (now Stockholm), he also kindly examined the inscription. His reading is very much the same as Shri Ramachandran's:

tata śasakakāla [ti]
taḥ pūrya
[*mva?*] ta *rāva*
priya ti
ṇītāḥ ga

Dr. Lienhard writes:[2] "The text is so fragmentary that it seems nearly out of the question to read a meaning into it. To judge from the ductus the inscription derives from the 2nd to 4th cent. A.D.: it is as far as one can see written in a Sanskrit to which no objection can be offered (except *tata* instead of *tataḥ?*). In its state of preservation the inscription consists mostly of parts of words, which scarcely can without further trouble be restored." The tablet was found in I:B6.

SEALS

The bronze seal pl. 81:22 has an inscription, which has kindly been studied by Mr. A. D. H. Bivar at the Ashmolean Museum, Oxford, who says:[3] "From its form and the shape of the Brahmi characters one would suppose a date about 300 A.D., i.e. shortly before the development of the standard Gupta script. For the general arrangements, with circular 'device' above, and inscription below, one may compare the Catalogue of the Southesk Collection of Antique Gems, No. P 15, of which, however, the letter forms are later. It is apparently the seal of a male person of private station." Mr. Bivar reads the inscription as "A-ra-la (?) -da-sa-say, a personal name in the Genitive case." He adds: "These personal names compounded with -dasa- 'slave of-' are very common in India as are corresponding formations in all the other Oriental languages, but I have not yet succeeded in

[1] Letter of 15.4.1954.
[2] Translation from a letter in German of 10.3.1958.
[3] Letter of 5.4.1955 and a later addendum.



Fig 117 1/1 Terracotta sealing S

finding an explanation of the first component Of course there are many unexplained elements in personal names from Northern India during the "Scythian" period That this particular compound is unattested is thus puzzling but is not anything against it."

The bronze seal pl 81 21 has no inscription In any case no traces can be seen now Fig 117 shows a terracotta sealing, which was found on the surface of the mound at the side of trench I Professor H S Nyberg and Assistant professor N Simonsson Uppsala University, label the inscription as Brahmi script

CONCLUSIONS

The Swedish excavations at Rang Mahal provide some evidence concerning the material aspect of life in a North-West Indian village during the late Kushan period. Owing to inadequate literary sources the history of this area and period is little known.

Shortly after the death of the Emperor Asoka in 232 B.C. the Gandhara empire broke up and the following period was taken up by the attacks of Greco-Bactrian princes and generals, who were also continually fighting amongst themselves. The Greeks were eventually forced out by three main groups of invaders, the Sakas or Scythians, the Phalavas or Parthians and the Yue-chi or Kushans. The Sakas had been driven from their homes in Central Asia by a related tribe, the Yue-chi, and at the time of the Birth of Christ they were living in South Afghanistan in an area known as Sakastana (the modern Sistan). Later their area of influence was extended to the Indus valley and into Western India, part of which had already fallen into the hands of the Parthians. Coins are found which were struck for Scytho-Parthian kings in the first century B.C. Feuds between the Parthian princes weakened the power of these kings, and made it possible for the Yue chis (who at this time were driven from the Chinese borders by the Huns) to settle in Bactria and to penetrate down to the Indian border areas. One of the rulers of the five Yue-chi principalities became overlord and is known by the name of Kujala Kadphises or Kadphises I. He was followed by his son Wema Kadphises or Kadphises II, whose successor (in a more or less direct line) was Kanishka I, the greatest of the Kushan rulers; he conquered not only Northern India and Kashmir but also part of Chinese Turkestan with Kashgar, Yarkand and Khotan. He was converted to buddhism and his capital Purushapura (the modern Peshawar) became a centre of buddhist culture; Kanishka was also a generous patron of literature and art. The basis of the development of the Kushan empire was extensive trade with the Roman Empire and the Far East: it is during the reign of Kanishka I that buddhism is supposed to have been introduced into China.[1]

Kanishka reigned for twenty-three years and was succeeded by Vasishka who, after a short reign, was followed by Huvishka, a worthy successor of the great Kanishka both as conqueror and patron of the arts. His capital was Mathura.

Huvishka was succeeded (probably after the short reign of Kanishka II) by Vasudeva, the last of the great Kushan rulers. The Kushan kingdom was threatened by the expanding powers of the Persian Sassanians. Ardishir-i-Babegan (226—240 A.D.) defeated the Kushans in Bactria and

[1] For the historical background see *inter alia* H. G. Rawlingson, *India*, London 1937; R. C. Majumdar, H. C. Rayshandhuri and Kalinkar Datta, *An advanced History of India*, London 1949; A. Powell-Price, *History of India*, London 1955.

pressed down into Gandhara and the Punjab. It has been presumed that the great hoard of coins of Vasudeva, found buried in a buddhist monastery near Taxila, as well as the destruction of several other buddhist monasteries in the neighbourhood, bear witness to these Sassanian raids.[1]

"Although, however, the Kushan Empire lost outlying territories both east and west", says Marshall, "there are no grounds for assuming, as some writers have done, that the heart of the empire, that is, the Panjab, Gandhara and the Paropamisadæ[2], was split up into a number of independent principalities Unfortunately, of the successors of Vasudeva I in the third and early fourth centuries A.D. we know no more than can be gleaned from their coins, which is singularly little. Debased copies of Vasudeva's copper issues continued to be struck, as those of Hermaeus had been, long after his death, and large numbers of them have been found at Taxila." Marshall mentions finds of gold coins from other sites which "are probably to be assigned to the third or early fourth centuries A.D., viz. Kaneshko (?Kanishka III), Vasu (?Vasudeva II) and another Vasudeva". Bachhofer[3] also argues for the retention of Kanishka III as the successor to Vasudeva's large empire which included North and North-Western India as well as Bactria, the centre of the Kushan empire. He maintains, however, that this latter area was later ruled over by Vasudeva II, also of Kushan blood.

J. E. Lohuizen-de Leeuw[4] also argues against the theory of "the crumbling of the large Kushan kingdom after Vasudeva I into a number of smaller, independent states, mostly reigned over by dynasties originally of foreign descent." Concerning the successors of Vasudeva she says, "there is no reason to doubt that they were relatives of Kanishka (I)."[5] She maintains that she has "pleaded for a continuity, not only in politics but also in cultural life,"[6] between the era of the great Kushan rulers and that of their successors. In this light it seems most reasonable to regard Kanishka III as a king of the Kushan period.[7]

The coins found in the excavations at Rang Mahal show that this site was mainly settled during the reign of Kanishka III. Unfortunately the coins found in the lowest levels of trench I are in such poor condition that they cannot be identified (29 coins from layers 9 to 14 are unidentifiable). All the identified coins (11) from these levels were minted by Kanishka III or are (according to our adopted terminology) "Murundas". The only exceptions are a coin in B9 struck for Huvishka and another, in B13, struck for Vasudeva. These two coins cannot, of course, influence our dating.

The chronology of this period, the "Saka Era"[8], is established in relationship to the chronology of the West. It begins in the year 78 A.D., a date securely related to Western chronology. Owing, however, to the scanty literary sources the sequence of the Kushan rulers is uncertain and very much discussed.[9] The two scholars who have most recently contributed to this debate hold rather different opinions in the matter.

[1] Marshall, *Taxila*, I, p 73
[2] A province in modern Afghanistan
[3] Bachofer, p 438
[4] Lohuizen-de Leeuw, p 320
[5] *Ibid*, p 321, note 63 I cannot here quote the entire argument, which especially argues against Ghirshman
[6] *Ibid*, p 321
[7] Cf Bachhofer p. 437 f
[8] The term Saka Era does not mean that the Kushans were Scythians Their racial relationships have been mentioned above
[9] About this discussion and its repercussions on the chronology of other periods see the extensive summary and bibliography in Lohuizen-de Leeuw, p 1 f

Lohuizen-de Leeuw believes that Kanishka was the first ruler of the Saka Era. As he is known to have ruled for twenty-three years she gives the sequence and dating as follows: Kanishka 78—101 A.D., Vasishka 102—106 A.D., Huvishka 111—138 A.D., Kanishka II 119 A.D., Vasudeva I 152—176 A.D., Kanishka III 192 A.D. and, more doubtfully, Vaskusana at 200 A.D. with Vasudeva II at the beginning of the third century.

Marshall's chronology, however, is rather different.[1] He presumes that Vema Kadphises was the first ruler in Saka and that he died in or about the year 100 A.D. He further believes that there was an interval of about twenty-five years between the death of Vema Kadphises and the reign of Kanishka I, whose dates he gives as 128—151 A.D. The dynasty thus came to power in 128 A.D., consequently the death of Huvishka (which occurred between the sixtieth and seventy-fourth year of the dynasty) would have taken place between 188 and 202 A.D. Vasudeva, according to Marshall, died about 230 A.D.; the difference between this date and the one given by Lohuizen-de Leeuw is some fifty-four years.

All theories concerning the later Kushan rulers are based on the evidence of coins. We have already mentioned that coins of this period have a very long circulation, and that the presence of a coin in a particular layer does not necessarily date the layer. It is therefore impossible to make any dating statements based on the occurrence in different levels of a small number of coins of Kanishka I, Huvishka and Vasudeva. The coins of Kanishka III in the lower levels of trench I:B, however, do obviously give more dating information. Two Kanishka III coins were found in I:B14 and others were found in B12, 11, 10 and 8. So called "Murunda" coins were found, however, in such early levels as I:B13 and also in B12, 11, 10 and 8. It is obvious that "rough imitations of copper coins of Vasudeva and Kanishka III seem to have continued being issued in Northern India down to A.D. 300 and perhaps later" and that they "are extremely plentiful."[2] But referring to the explanation of the use here of the term "Murunda", given above (p. 172), it is also obvious that there is often no difference at all in time between a coin, labelled Kanishka III and one labelled Murunda.

The date of these coins agrees well with the date of the seal (pl. 81:22) found in I:B11. Bivar suggests the seal's legend can be dated to about 300 A.D. from the point of view of its form and the shape of the letters (cf. p. 177).

It is impossible to date the bottom level of trench I, layer B14, earlier than the period of Kanishka III, but on the other hand, it is fairly certain that the coins in this level had not been in circulation for any length of time before they were buried, for there is in this instance another indication of date. A C14 analysis, performed by dr Ingrid Olsson at the C14-dating station at the Institute of Physics in Uppsala dates pieces of wood-charcoal from a fireplace at the bottom of layer 1:A12 to 137 A.D.$\pm$120.[3] Although a margin of$\pm$120 years must be reckoned with, the experts say that it is very unlikely that the true date should lie at one of the extremes.[4] According to this argumentation the date of I:A12 can not be later than the middle of the third century A.D. But as A12 stratigraphically is not earlier, but rather somewhat later, than I:B14 we arrive at a latest date for B14 of about 200 A.D.

[1] *Taxila*, I, p. 69 f. I quote only those dates which are of interest to us in this context.

[2] I quote Bivars letter of 5.4.55.

[3] The result will be published in American Journal of Science, Radiocarbon supplement (the proof is called U 1).

[4] The date is calculated from the day the wood ceased to grow, but it is unlikely that in this area wood was stored for any length of time.

Layer B14 in trench I is, however, not the earliest settlement remains at Rang Mahal. As a result of the drillings of G. Eriksson in the sand dunes of the area, we can relate some of the lower levels of trench I with the lower levels of trench II (see above p. 57). It can be seen that the layer of bricks at point e in the pit under I:B14 (fig. 19), which in some way was moved to this place from its original position (cf. Arbman above p. 65), corresponds to layer 13 A of trench II. This means that the layer II:14 is older than, or contemporary with, layer e in trench I. Eriksson further points out (p. 56 f. cf. p. 139) that the bottom of this pit corresponds to the bottom level, 16, in trench II. Layer I:B14 is, according to Eriksson, a little later than II. 11.

The actual difference in date between I.B14 and II:16 is not necessarily very great; a sand dune can be formed either in a few days or over a period of years. The objects found during the excavation are remarkably homogeneous in character, the small variation in each level must lead us to suggest that the settlement of the site was not of any great duration. Rang Mahal must have been settled properly for the first time (e.g Eriksson's III settlement, cf. p. 52 f.) towards the end of the second century and at the very latest by the year 200 A.D.

When did the occupation cease? The two Mogul coins can be counted out as an indication as they belong to the period when the mound was used as a cemetery (one of them is a grave find) and it is unlikely that there was a settlement in the Mogul period so near the burial ground. The coin of a Rajputana ruler of the 13th century mentioned above was found in the topmost level of trench II [1] Apart from these the latest coins are the Murunda examples. There is a C14 date of 1525 ± 70 years from a piece of a kind of wood - which can not be identified - found in the I·A^{V} Pit 20[2], which contained the best specimens of painted pottery[3] (cf. p 76). This dated the pit to the first half of the fifth cent. A.D., it belongs to a late, but not the latest phase of the settlement of the mound.

Still an other C14 analysis performed by dr Olsson in Uppsala (U52) on charcoalpieces from an ash- and coal-layer in II 4, has given 1480 ± 70 years This means that the mother-material finished growing the year 478 ± 70 A.D., which broadly speaking must be the time when the layer was composed In the eastern part of the trench where this proof was taken the layer II:4 was covered by two fairly thick, but sterile earth-layers The topmost, layer II:2 must have been deposit, when the last houses so to say "melted down". It is not impossible that this part of the settlement already at that time was deserted. Judging from result of these two last mentioned proofs it seems reasonable to suppose that the site was deserted before 600 A.D. The climatological conditions of this period probably caused the evacuation (cf. Eriksson, p. 33).

[1] Concerning the coins cf p 171 f

[2] The proof is made by engineer Gote Ostlund, Radioactive Dating Laboratory at Geological Survey of Sweden (the proof is called St 192) The result is published in Science 126 (1957) p 493—97

[3] Fragments with the same type of pattern were also found in lower levels, and this date does not indicate the earliest phases of the manufacture of this pottery.

The temporary visitor to the ancient vill
excavations might perhaps, if he immediately
with the same name, remark: "Here the peo
is true — and yet it is not true. The similari
now, as they were then, built of sun-dried
predominant role in the stock of household
the old ones, and even in our day the inhabi
way are reminiscent of the ancient ones.[2] Just
by modelling camels, cows and the sacred "
had the same understanding for their childr

The villagers in our day have more or less
and they, too, sow their seed: but here comes
tions are the same now as then. We can w
Mahal time" lived under far more favourab
stood still — in several respects it has been

The members of the Swedish Archaeologi
conditions under which the people in the s
1953 the expedition commenced operations,
one home. Not a drop of rain had fallen for
seed without obtaining any harvest. This
land as for those who had one, for witho
The water tank had almost run dry. One of
before leaving the boiling-hot desert in the l
some cows which had sunk in the mud in an
the tank. Preparations were made to send
cowherds to seek pasture, though one knew
day inhabitants of this small desert village h
obtaining any food at all for themselves

[1] The villagers of today do certainly not descend direct
from the old village, which was surely deserted long ag
(p. 181). They settled here when the present tank was
in the 1870*ties*, but they probably came from somewhere

returned to Rang Mahal the transformation almost gave me a shock: the desert burgeoned, the millet gave a harvest, the watermelons were stimulating thirst-quenchers — even human beings began to take on a new lease of life; the monsoon had been generous indeed!

During the early centuries of habitation in old Rang Mahal the villagers led by no means the same arduous life. They lived in a more fertile and friendly environment, in which trees and bushes afforded shade on scorching days The river brought down mud rich in nutriments.[1] Provided they sowed they need not be anxious that the harvest would fail The supply of water enabled them to cultivate rice,[2] the favourite kind of grain above all others in the East. Cattle were evidently numerous, the zebu being the predominant breed; the villagers may possibly have eaten its meat[3] — at any rate they evidently found buffalo meat tasty and avidly gnawed the bones —, but sheep and goats provided by far the most popular food. The meat supply was supplemented by means of successful gazell and wild-boar hunting with dogs, presumably of the greyhound breed, as quite essential allies in the chase. Birds were probably hunted, and fish was certainly not despised either.[4] The ass, the horse and the dromedary were among the domestic animals in those days.

The Rang Mahal villagers were very largely self-sufficient not only in regard to food They themselves made their clay vessels.[5] They had a feeling for form and liked to decorate their pottery. The finest of these articles undoubtedly surpass modern ware. If they themselves actually made the fine thin-walled sprinklers which they used a good deal, they were skilful potters The later moulded vessels have been made on the site, the potters have left a number of moulds behind them as evidence.

We do not know whether they span and weaved in old Rang Mahal, but spinning at any rate is one of the most obvious tasks in a country village in which there are wool-bearing animals The women, and perhaps the men as well, adorned themselves with jewellery, albeit of cheap material.[6] There is considerable evidence that the village maintained its own industry for the manufacture of bracelets of shell — who knows? they may even have been an article for export.[7] But they also wore bracelets of glass and glazed clay.[8]

If the common man's dwelling was simple and the rooms small[9], yet he manifestly made some attempt to adorn them with painting,[9] just as they do in present-day Rang Mahal and the neighbouring villages.

There evidently existed in the old Rang Mahal a temple, perhaps several, adorned with finely ornamented fired brick, though they may also have formed part of some "palace-like" building [10] Reliefs in clay appear to have belonged to temples. The religion was undoubtedly Hindu. Not only have the gods been prayed to in the temples but simple images of gods have formerly, as now, had their place in small niches intended for the purpose either inside or outside the dwellings. Niches of this kind have been let into the house wall or have been constructed by resting two large flat

[1] Cf p 44
[2] Cf p 33 and 79
[3] Lepiksaar is somewhat doubtful, although he states that chopper marks indicate that the carcases were cut up in a quite professional way Cf p 197
[4] Admittedly we possess only one bone from a carp, but it is hardly to be expected that fishbones would be found in quantities comparable with other animal bones
[5] One of the evidences of this is the fairly numerous finds of "konoras". Cf pl 80 9, 10, p 164
[6] Cf pl 83 2, 5 pl 81 1—17, 21, pl 82 2—20 show some beds of somewhat greater value
[7] Cf p 194.
[8] Pl 82 56—58, 60, 61.
[9] Cf p 87
[10] Cf p 84, 86, pl 79

stones against one another to form a triangle.[1] For the pleasure of the gods incense has been burnt in the vessels intended for the purpose[2], and worshippers' prayers have been accompanied by the ringing of small bells[3], as is done also today. Maybe the small votive tanks and possibly also small primitive female statues were dedicated to the worship of the Mother Goddess.[4]

The inhabitants of the old Rang Mahal certainly could not read or write, nor can the people living in the modern village. A small clay tablet with an inscription and a couple of seals do not tell us much.

One could hardly write a paper on pleasures and diversions in connection with the village of our day, but that does not mean that life is boring to those who dwell there. We know nothing of them apart from the festive occasions afforded by family life and the turning-points of the year. It was probably much the same in former times. Naturally it was possible to find formerly, as now, a group of men, certainly not women, with dice in their hands trying their luck at a game of hazard.[5] There was certainly no night carousing. The light which the small oil lamps gave did not encourage sitting up late at night.

It is quite certain that misfortune sometimes came upon the inhabitants of the ancient village. Fires must have taken toll of human beings and animals alike.[6] Hyenas, porcupines and boa-constrictors might well cause a lot of mischief.

But serious trouble awaited the generation that experienced the years when the monsoon began to show that it could be capricious, fail in its beneficial effect on the soil and also exercise a negative influence on the formerly so bountiful river. Finally, the inhabitants of the village had to face the day when there was no choice: either to die or to migrate with their cattle and all they possessed until they found a region that had been spared, in which they could settle down. It is not improbable that the entire village moved all at once; some began their wanderings, others followed after, some perhaps finding their way back again but having come more to adopt a nomad's life. At last the day came when the place was desolate; the ancient village was dead.

[1] Cf. p. 72, 76 pl. 8:1 (niches), p. 77, pl. 6:3, bricks leaned against each-other.

[2] Cf. pl. 68.

[3] Cf. pl. 83:1 and perhaps pl. 85:10.

[4] Cf. pl. 71:1—4, 80:5.

[5] Cf. pl. 70:11, p. 164, 170.

[6] Cf. p. 196 and 197.

THE MOHAMMEDAN GRAVES

On the top of Rang Mahal, where trench I was dug, 12 graves containing skeletons were found just below the surface. These graves had been dug in the superficial stratum of the mound and have no connection, either cultural or chronological, with the rest of the strata investigated. The construction and situation of the graves give the impression that they belong to a limited phase, and thanks to a coin minted for the Great Mogul Akbar (1556—65), pl. 86:41, which was found in grave 1 they may be dated to the sixteenth century.

Grave 1. Orientation NNW—SSE with the head towards NNW. No traces of a coffin were found. A brick lay on top of the skeleton, otherwise there was no form of paving or demarcation. The body lay in a supine position with the arms along its sides The skeleton was in a fairly poor state of preservation. At about knee height were found a bronze coin and a fragment of cloth, which had been preserved by verdigris.

Grave 2. Orientation NNW—SSE with the head towards NNW. No traces of a coffin or any demarcation. The body lay in a supine position with the arms along its sides. The skeleton was in a fairly poor state of preservation.

Grave 3. Orientation NNW—SSE with the head towards NNE. No traces of a coffin or any demarcation. The body lay in a supine position, the arms along its sides. The skeleton was in a fairly poor state of preservation. On the skull were remnants of hair, and in the hair were pieces of a double comb, much decayed.

Grave 4. Orientation NNW—SSE with the head towards NNW. No traces of a coffin or any demarcation. The body lay in a supine position with the arms along its sides but with the hands crossed or folded. The skeleton was fairly well preserved.

Grave 5. A child's grave Orientation N—S. The head towards the north. No traces of a coffin or any demarcation. The body lay in a supine position with the arms extended along the sides but with the under-arms turned inwards. The skeleton was in a fairly good state of preservation.

Grave 6. Orientation NNW—SSE with the head towards NNE. No traces of a coffin or any demarcation. The body lay in a supine position with the arms along its sides. The lower parts of the legs lay inside the E—W profile wall. The skeleton was badly damaged and decomposed.

Grave 7. Orientation N—S with the head towards N. The body lay in a supine position with the arms along its sides and the legs slightly bent. The skeleton was in a fair state of preservation. Just left of the skeleton in a N—S direction a brick wall was found made of, mainly fragmentary, stones placed on edge. The row of stones runs in a curve. The lower edge of the stones was about 20 cms. above the skeleton. The row of stones extended 75 cms. north of the skeleton's skull, fig. 118.



Fig. 118. Mohammedan grave 7.

Grave 8. Orientation N—S with the head towards the north. No traces of a coffin or any demarcation. The body lay in a supine position with the arms along the sides an the feet crossed. The head was not lying in position but on the left shoulder, turned right round, so that the face looked towards the north and the skull stood straight up. The grave has obviously been damaged. The skeleton was in a fairly poor state of preservation.

Grave 9. Orientation N—S with the head towards the north. There were no traces of a coffin or any demarcation. The body lay in a supine position with the arms along its sides and the under-arms bent inwards. The lower parts of the legs were crossed. The head lay turned towards the left. The skeleton was fairly well preserved.

Grave 10. A child's grave. Orientation N—S with the head towards the north. There were no traces of a coffin or any demarcation. The body lay in a supine position with the right arm along the side, the under-arm being bent inwards. The head was turned so that it lay on the right side. The left hand lay on the left shoulder and the feet were crossed. The skeleton was in a fairly poor state of preservation.

Grave 11. Orientation NNW—SSE with the head turned towards NNW. There was no trace of a coffin or any demarcation. The body lay in a supine position with the arms along its sides and the hands crossed. The upper part of the body was hunched up so that the skull stood almost straight up. The skeleton was in a poor state of preservation.

Grave 12. Orientation N—S with the head towards N. The body lay in a supine position with the arms extended and the right hand under the hip and the left under-arm bent imwards. On the east side was a row of irregular bricks placed on edge. The under side of the stones was placed on a level with the skeleton. The skeleton was fairly well preserved.

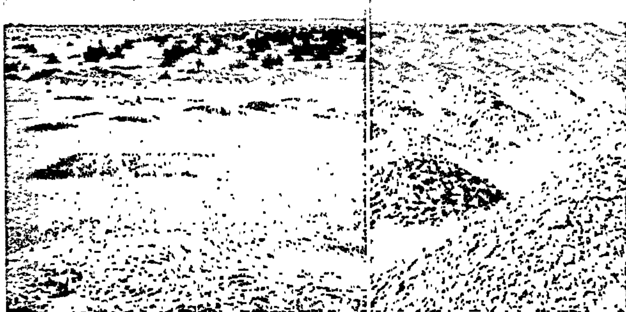


Fig 119 Mohammedan graves at the side of Rang Mahal seen from the slop of the mound
Fig 120 Mohammedan graves on the mound at Sardargarh

The site of the graves will be seen from the plan, fig. 17. They are all orientated N, NNW—S, SSE. The heads are turned towards the N, NNW. Each body was in a supine position with the legs stretched out. The arms are straight, though in one or two cases the under-arms or the hands are crossed In most cases no form of sepulchral structure has been built up, the body having been merely buried in the mound at the depth of a spade or two. Exceptions are graves 7 and 12. Here, on the south and west and on the east side of the grave respectively are of a row, mainly fragmentary, bricks placed on edge (See the plan and fig. 118.) There is no reason to doubt that they were old bricks already existing on the mound which were used for making the graves. There is also, of course, a possibility that the skeletons were buried in already existing remnants of walls

The investigation carried out at Rang Mahal was concerned with only a small part of the ruins of the mound and there are also graves, of course, in the sections that were not examined. The rectangular groups of stones visible on the photo, fig. 119, surely mark the site of graves Even among the ruined mounds in the desert region around Rang Mahal there are relics which there is reason to suppose are those of Mohammedan graves. Their form is somewhat different here — it is a question of smaller mounds. (The surface soil on Rang Mahal was at the commencement of the work of excavation relatively level and destroyed, so that it is not absolutely certain that the surface material had not originally been heaped together to form mounds.) Fig. 120 shows how the plane top of the mound at Sardargarh, situated 22 km from Rang Mahal, contains small mounds. As will be seen from the illustration, these consist mainly of the bottoms of urns and potsherds. It is conceivable that the persons, presumably Mohammedans, who buried their dead here used the old culture strata which through sandstorms, rain etc. had b

clean and homogeneous on the surface. Mounds of this type were in fact observable at the foot of Rang Mahal. If Rang Mahal's Mohammedan graves dug in the surface stratum without any visible mound and the Sardargarh superficial burial-ground of small mounds lying close together and consisting mainly of the bottoms of urns and potsherds are regarded as two different types, then a third type might be registered at Jetsar, situated about 35 km from Rang Mahal. It is here, as at the other sites, a question of graves containing skeletons, though here some of the large painted storage vessels of the Rang Mahal type had been used as some form of roof over the graves which are formed as pits, about two meter long, dug down in the ground. Here, too, the graves were placed together on a site forming a burial-ground on the top of the mound. The ruined mounds in the northern part of the Rajputan desert present owing to their size and construction a striking feature of the landscape, and it is quite understandable that they were regarded as suitable for burial sites.

REPORT ON THE MOLLUSCA FOUND DURING EXCAVATIONS AT RANG MAHAL

BY

THE LATE

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The molluscan shells found at the above site have been identified by comparison with specimens in the British Museum (Natural History) principally from the large series deposited there by the late Lt Col Godwin Austen, collected during his work on the topographical survey of India towards the end of the last century.

The shells are confined to limnetic and marine species and are mostly in good preservation With few exceptions the fourteen species in the collection are known to have been used by man for food, implements and ornaments. The limnetic or freshwater forms preponderate as would be expected from such an inland place as Bikaner. There are ten freshwater species and four marine the latter undoubtedly brought from a distance.

The most interesting feature of the present collection from the archaeologists point of view, is the comparatively large number of Chank shell bangle fragments mingled with the other shells, and it will be suggested later that an early bangle factory may have existed in the neighbourhood for there is a great similarity in the Bikaner finds to those recorded by Hornell (1914, pp 50—51) where he notes the association of Chank bangle fragments, *Viviparus* shell beads, and *Cypraea moneta* from made ground at Hampasagra, on the Tungabhadra These three items, with the addition of *Unio* and *Pila* shells all occur together in the present collections, notably those from Trench I·B.8.

List of species from Rang Mahal, Bikaner, systematically arranged

(a) *Limnetic species*

GASTROPODA PROSOBRANCHIA

Fam: Viviparidae
1. *Viviparus bengalensis* (Lamarck) — *Tamil* umachchi

Fam: Ampullariidae
2. *Pila globosa* (Swainson) — *Tamil* nathai

Fam· Thiaridae
3. *Melanoides tuberculata* (Müller)

GASTROPODA PULMONATA

Fam. Planorbidae
4. *Planorbis (Indoplanorbis) exustus* Deshayes

BIVALVIA EULAMELLIBRANCHIA

Fam: Unionidae
5. *Parreysia favidens* (Benson)
6. " *corrugata* (Müller)
7. *Lamellidens marginalis* (Lamarck)
8. *Unio (s.str.) caeruleus* Lea
9 " *shurtleffiana* Lea

Fam: Corbiculidae
10. *Corbicula striatella* (Deshayes)

(b) *Marine species*

GASTROPODA PROSOBRANCHIA

Fam: Cypraeidae

11. *Cypraea ocellata* Linné
12. » *moneta* Linné
13. » *pallida* Gray

Fam: Vasidae

14. *Xancus* (= *Turbinella*) *pyrum* (Linné) *Tamil* Chanku or Sanku, Sanskrit: Sankha. Bangle fragments only.

Notes on the shells and bangle fragments.

1. *Viviparus bengalensis.* This species lives in tanks and streams throughout India and is occasionally eaten in the Southern Tamil districts, where it is known as "umachchi" (Hornell, 1922, p. 108). There are examples of this species in most of the Rang Mahal samples and they are particularly numerous in I:B8 and A^{V}, 3, 4, 5 and 6. Seven of those in B8 having been roughly pierced for stringing.
A number of shells have the upper part of the spire broken off, but whether this has any particular significance beyond removing the flesh for food is not known. Specimens in all stages of growth are in the collection.
2. *Pila globosa* also known as *P. carinata.* This species is still of common occurrence in the tanks, ponds, lakes, streams and paddy fields of India, being particularly plentiful in areas in which there is a large quantity of succulent aquatic vegetation (Prashad 1925, p. 92). In the Tanjore and Tinnevelley districts it is regularly collected, after the paddy has been harvested, by poor people who use it to eke out their ordinary meals. It is also used medicinally as an application for sore eyes (Hornell, 1922, p. 109). No particular use appears to have been made of these large shells after extraction of the flesh for food. *P. globosa* has a hard calcareous operculum, of which there are two examples in I:B 5, 1 pierced for stringing and one broken in such a way that it could have been used as a scraper; one in I:B 8 has a large hole in the centre either for stringing or for use as a scraper.
3. *Melanoides tuberculata.* This is a widely distributed freshwater snail which occurs in streams throughout the East and is represented in the Bikaner collection by the merest fragment of a single specimen, thus indicating that it may not have been regarded as any use for food or of any particular religious or ornamental value.
4. *Planorbis exustus.* This is another extremely common Indian species. Only three specimens are in the collection and it may have been regarded as valueless like the preceding species of *Melanoides.*
5. *Parreysia favidens.* An enormously variable and widely distributed species of freshwater mussel, which appears in the literature under many alternative and varietal names, but can usually be distinguished by the rather coarse hinge teeth and stout shell. Probably used as food by the early peoples.
6. *Parreysia corrugata.* Is as widely distributed and variable as *P. favidens* but is generally more ovoid in shape and somewhat thinner.
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stricted to the extreme umbone, or spread over the greater portion of the surface of the shell" (Preston 1915, p 137)

The numerous valves available from Bikaner are naturally rather worn and chalky but the sculpture is visible on most, showing it to extend little beyond the umbonal area.

9. *Unio shurtleffianus* Rather larger than the preceding and considered by Preston (1915, p. 138) to be a doubtful species. Although the umbonal sculpture of *U. shurtleffianus* is fainter than in *U. caeruleus* it might prove on examination of a long series of specimens to be that species.

10 *Corbicula striatella.* Only a single valve of this shell is in the collection. It is the commonest Indian species of the genus and occurs practically all over India; it has no apparent significance either as food or ornament.

11. *Cypraea ocellata* This common Indian species is represented in the collection by a single broken specimen from I·B 2. The species occurs on the Mekran coast and at Karachi.

12 *Cypraea moneta.* Twelve specimens of *Cypraea moneta* or Money Cowry are present in the collection, nine of which have had the dorsal surface rubbed down for stringing in the same manner as that figured by Hornell (1914, plate V. No. 3456—13) noted by Jackson (1917, p. 165) to be the characteristic Ancient Egyptian and East African fashion. Four of the rubbed-down shells are marked I:A 5, the five remaining single specimens I·A'6, A 7, B 8, B 12 and B 14 respectively. Two of the nine *C. moneta* have been merely pierced through the dorsal ... [illegible]

[illegible] ... to the dorsal one.

The remaining specimen of the twelve (II:H 4) is whole and undamaged.

C. moneta is abundant on the reefs near Pamban, where it attains a larger size than those brought from the Maldive Islands. Even now it is still employed as small change in the bazaars in India where it is esteemed also as an ornament and as an amulet. The lore of the Money Cowry would fill many volumes for it has been regarded as a charm and amulet from the earliest times. The spirit of fertility is supposed to be indwelling in the Cowry shell by many races of man and thus it has been closely associated with ... [illegible]

[illegible]

Jackson (1917, p 123 et seq) gives a great deal of information on the commercial use of cowries, which formed the bulk of currency "between the beginning of the Christian era ... [illegible] 1203" [illegible]

excha[illegible]

Gulf [illegible] ... may have been landed somewhere in the ... and sent north to that place. Jackson, however (1917, p. 168) says that Bengal seems to have been the great market for the cowries from the Maldive and that they were widely distributed over India not only over the plains of the north and north-west but also along the ... [illegible]

layas and to the [illegible]

quantity to Inc[illegible]

13 *Cypraea pa*[illegible] ... specimen marked I B 8 The colour of this species is normally much darker than the Bikaner shell, which appears to have been subjected to heat; the base has been flattened by rubbing down and the dorsal surface has been rubbed down into three facets for some ornamental purpose — probably a bead. Bruce Foote found a *Trochus* or Top Shell similarly treated at Damnagar, Kathiawar Province. *C. pallida* occurs plentifully at Karachi

14 *Xancus* (=*Turbinella*) *pyrum.* Bangle fragments only.

The Indian Conch, Sacred Chank or Surti has been an object of veneration in peace and war by the Hindus since time immemorial, indeed Hornell, upon whose researches these notes ... [illegible] quency of its appearance in Eastern [illegible]

talismans as the great Excalibur wiel[illegible]

of the Viking sagas in European m[illegible] ... and the magic Tyrfing

as ceremonial trumpets in [illegible] ... ed and gilded are used

(b) *Marine species*

GASTROPODA PROSOBRANCHIA

Fam: Cypraeidae

11. *Cypraea ocellata* Linné
12. » *moneta* Linné
13. » *pallida* Gray

Fam: Vasidae

14. *Xancus* (=*Turbinella*) *pyrum* (Linné) *Tamil* Chanku or Sanku, Sanskrit: Sankha. Bangle fragments only.

Notes on the shells and bangle fragments.

1. *Viviparus bengalensis.* This species lives in tanks and streams throughout India and is occasionally eaten in the Southern Tamil districts, where it is known as "umachchi" (Hornell, 1922, p. 108). There are examples of this species in most of the Rang Mahal samples and they are particularly numerous in I:B8 and A^{V}, 3, 4, 5 and 6. Seven of those in B8 having been roughly pierced for stringing.
   A number of shells have the upper part of the spire broken off, but whether this has any particular significance beyond removing the flesh for food is not known. Specimens in all stages of growth are in the collection.
2. *Pila globosa* also known as *P. carinata.* This species is still of common occurrence in the tanks, ponds, lakes, streams and paddy fields of India, being particularly plentiful in areas in which there is a large quantity of succulent aquatic vegetation (Prashad 1925, p. 92). In the Tanjore and Tinnevelley districts it is regularly collected, after the paddy has been harvested, by poor people who use it to eke out their ordinary meals. It is also used medicinally as an application for sore eyes (Hornell, 1922, p. 109). No particular use appears to have been made of these large shells after extraction of the flesh for food. *P. globosa* has a hard calcareous operculum, of which there are two examples in I:B 5, 1 pierced for stringing and one broken in such a way that it could have been used as a scraper; one in I:B 8 has a large hole in the centre either for stringing or for use as a scraper.
3. *Melanoides tuberculata.* This is a widely distributed freshwater snail which occurs in streams throughout the East and is represented in the Bikaner collection by the merest fragment of a single specimen, thus indicating that it may not have been regarded as any use for food or of any particular religious or ornamental value.
4. *Planorbis exustus.* This is another extremely common Indian species. Only three specimens are in the collection and it may have been regarded as valueless like the preceding species of *Melanoides*.
5. *Parreysia favidens.* An enormously variable and widely distributed species of freshwater mussel, which appears in the literature under many alternative and varietal names, but can usually be distinguished by the rather coarse hinge teeth and stout shell. Probably used as food by the early peoples.
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The remaining specimen of the twelve (II H 4) is whole and undamaged

C. moneta is abundant on the reefs near Pamban, where it attains a larger size than those brought from the Maldive Islands Even now it is still employed as small change in the bazaars in India where it is esteemed also as an ornament and as an amulet The lore of the Money Cowry would fill many volumes for it has been regarded as a charm and amulet from the earliest times The spirit of fertility is supposed to be indwelling in the Cowry shell by many races of man and thus it has been closely associated with many forms of marriage ceremony Fishermen in the East fasten Cowry shells to their nets to ensure a good catch and farmers place them as offerings to the mother earth to promote fertility of the soil

Jackson (1917, p. 123 et seq) gives a great deal of information on the commercial use of cowries, which formed the bulk of currency "between the beginning of the Christian era and the Mohammedan dynasty of A.D. 1203" In early times it appears that cowries were brought to India in quantities from the Maldive Islands to be exchanged for rice, and it is quite possible that the Bikaner cowries may have been landed somewhere in the Gulf of Cambay and sent north to that place Jackson, however (1917, p 168) says that Bengal seems to have been the great market for the cowries from the Maldive and that they were widely distributed over India, not only over the plains of the north and north-west but also along the east coast and even to the slopes of the Himalayas and to the Deccan plateau According to Melvill and Standen (1904, p 120) *C moneta* was also exported in quantity to India from the Persian Gulf, but at what period is uncertain

13 *Cypraea pallida* One specimen marked I B 8 The colour of this species is normally much darker than the Bikaner shell, which appears to have been subjected to heat, the base has been flattened by rubbing down and the dorsal surface has been rubbed down into three facets for some ornamental purpose — probably a bead Bruce Foote found a *Trochus* or Top Shell similarly treated at Damnager, Kathiawar Province. *C pallida* occurs plentifully at Karachi

14. *Xancus* (=*Turbinella*) *pyrum* Bangle fragments only.

The Indian Conch, Sacred Chank or Surti has been an object of veneration in peace and war by the Hindus since time immemorial, indeed Hornell, upon whose researches these notes are largely based, compares the frequency of its appearance in Eastern mythology and folklore with the equally frequent references to such potent talismans as the great Excalibur wielded by King Arthur, Charlemagne's famous Joyeuse and the magic Tyrfing of the Viking sagas in European myth and legend. Complete Chank shells, suitably carved and gilded are used as ceremonial trumpets in most of the Hindu temples, and for a variety of civil ceremonies

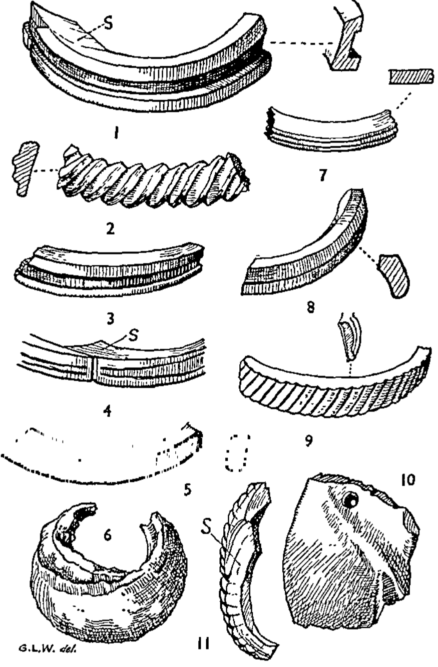


Fig 122. 1), 3—11) ca 1/1, 2) 2/1 1, 3) Heavy Bala type bangles with simple but deeply cut grooves, 2, 9) Two styles of oblique groving, 4) Roughly cut grooves with horizontal cut disguising joining of the septum with body whorl of shell, 5) Smooth, plain "Dhola" bangle, 6) Ancient waste shoulder fragment (cf with fig 121 C), 7) Narrow "Churi" type bangle with narrow grooves, 8) Smooth "Dhola" bangle with bevelled edges, 10) Fragment of worked Chank shell probably worn as a charm, 11) Obliquely grooved (or septa) bangle showing remains of septum(S) worked over on the outside (note incisions left by the cutting tool on the bangle edge)

1) I B5, 2) I AV1, 3) I A7, 4) I B6; 5) II 1, 6) I B4; 7) II H5, 8) II 12, 9) I B7; 10) I B11, 11) I B4

the wrists of growing youngsters to be replaced by larger sized bangles Hornell (1914, p. 154) notes that Chank bangles were given to babies as a protection against convulsions and "chedi", a form of rickets; they were kept on the wrists for about three years, at the end of which period the dangers of infection were considered past and the bracelets presumably struck off. The larger fragments might have some connection with the Indian custom mentioned by the same author (1915, p 50) of widows breaking their chank bangles and throwing them away at the first time of bathing after their husbands' death.

Relative sizes of the Rang Mahal bangles when whole were between 40 and 65 mm. in diam , the larger sized fragments showing signs of considerable wear. While there may be no particular significance in the size of the actual fragments it may be of interest to note that of the total of forty-three, ten are complete halves, nineteen about one third of the whole bangle and fourteen less than a quarter. When these groups are placed together the overall indication is that some definite method was used in removing or destroying the bangles, the extremities of many of the pieces showing clearly that at least one cut was made with a file or small saw in order to snap the bangle at the weakest point i e. near the junction of the septum with the body whorl of the shell.

Dating these bangle fragments may be difficult for the archaeologist for it is abundantly clear from the researches of Foote and Hornell that simple grooved designs, which could be obtained by rubbing down on hard stone, have been used since very early times and that the fragments may be much older than the layers from which they have been excavated

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BONE FRAGMENTS FROM RANG MAHAL

BY

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From the bone material excavated at Rang Mahal 806 specimens have been identified. The majority of these are very fragmentary and only a small number are complete. Recent fractures and scratches show that a number of the more fragile bones were broken during excavation, and it was possible to join some of these pieces together. With a few exceptions the fragments which were joined came from the same square of the grid. This fact must be bore in mind in any numerical estimate. Most of the bones bear cracks which formed at an early stage and which later expanded as a result of the action of calcium salts. The process of calcination is of widespread occurrence, being most prominent on the larger bones (e.g. buffalo) or in levels where bone fragments are most heavily concentrated. Variations in surface colouration are considerable and consequently certain conclusions can be inferred. It is still possible, at a depth of 2.27 m. (I:A9), to find bone (hare) which has retained its normal, yellow, colour. A small number of bones are of an olive-grey or brown patination, similar to that commonly found in bones of decaying animals — this patination is presumably caused by the decomposition of the blood and fatty substances. But a large number of the bones found at Rang Mahal are coloured in various shades of red, ranging from a light yellowish red to dark red-brown. Certain partly charred bones demonstrate that these colours are found, in zones, round charred portions of the bone, indicating perhaps varying degrees of heating of the meat-clad bone. An even stronger heat or burning produces a greyish white ash or distorted, cracked fragments which ring like porcelain. This last condition occurs but rarely at Rang Mahal (e.g. the ulna of goat). Black spots or stains on certain burnt bones are reminiscent of "dendrites" but on account of their distribution and position, they may have been produced by the ozzing and seething of the fluids of the body.

Apart from the skeletal remains of man it has been possible to identify at Rang Mahal thirteen species of mammal, four birds, three reptiles and one fish.

1. Man, *Homo sapiens.* 3 specimens. In the layer II:2a a number of fragments of an adult skeleton were found. The body had obviously been intentionally cremated and the fragments are burnt to an ash-grey colour and are difficult to identify. Other remains (such as the distal fragment of a left humerus and a left phalanx I, digit II, of the pes of an adult specimen from I:A^{V} 8 and the left mandible of a eight-year-old child from I:B 8) are of a yellowish red colour which, if we accept the above argument, may indicate that the bones belong to persons burnt to death in their houses.

2. Domestic horse, *Equus caballus.* Two specimens were found in I:A9 and B8. Judging by the three available molars they belong to a medium sized breed and the fairly complicated crimped enamel pattern on the chewing surfaces of the teeth are somewhat reminiscent to those of western horses.

3. Domestic ass, *Equus asinus*, or Indian Half-Ass (Ghorkhar), *Equus hemionus khur.* Five specimens were found in I:A Pit 9, A12, II:16, II:P, II:16. The fragments suggest a small equine animal, reasonably comparable with the *Equus pumpellii* (DUERST) from the Anau settlement in Turkestan. Several scholars (Hilzheimer 1926, Antonius 1936, Lundholm 1947) do not consider this breed to be a proper horse but class it as an onager (*E. hemionus*). It is possible that this wild half-ass was hunted in the area of Rang Mahal. It is also possible that the fragments belong to a large breed of domestic ass. The loose molar M^1, found in I:A Pit 9 has a long and flattened protoloph, it has no "spur" and is 24(+)mms. long and 26.5 mms. wide. A left metatarsal from II:16 is 255 mms. in length, 38.7×43.5 mms. in proximal diameter and 27×27 mms. in the centre.

4. Indian Wild Boar, *Sus cristatus.* One specimen. A strong tusk (left $\overline{C}$) and a front tooth (left I^2), found in I:A^{V}3

demonstrate that the wild boar hunt, so popular in present day India, is of ancient origin It is significant that no traces of domestic pig have been found.

5 Dromedary, *Camelus dromedarius.* Three specimens were found in I A9, B2 and B10. As only three bones survive (a left scapula from B2, a radius, of yellowish red colour, from A9 and a costa from B10), fragments of camel must be considered rare.

6. Domestic buffalo, *Bubalus bubalis* At least nineteen bones of eight specimens were found in I A8, B7, B8, B9, B13, II·9, II:12, II·13, II·H5², II:14 and probably also in I.A7, A9, A12, II:12, II P, II H9, II 16 Marks of chopping on both humerus and femur indicate that the carcases were cut up at the joints In the majority of cases the bone surface is of a yellowish red colour under the grey, crystalline surface deposit Buffalo meat was evidently eaten at Rang Mahal

7. Zebu, *Bos taurus indicus* Cattle dominate the animal remains of the site 508 bones were found and these represent some seventy-eight animals. The zebu appears to have predominated in India in much the same proportions as it does today. The skeletal material however does not allow any more detailed analysis of breed The best preserved skeleton (from I B10) has, however, typical zebu characteristics, e g flat orbits and long, slender metatarsals (cf. also numerous clay figurines representing the true zebu) The variation in size was considerable, probably due to sexual dimorphism As comparable measurements could not be taken from the material available, the following classification by sizes has been estimated by means of direct comparison with measured skeletons of domestic cattle in the Gothenburg Natural History Museum. According to these measurements twenty-seven specimens from Rang Mahal belong to a size group represented by a strong bullock of which the condylobasilar length is 525 mms Twenty-three specimens belong to a group represented by a cow of hornless breed of which the condylo-basilar length is 455 mms Eighteen specimens are smaller, including a young calf, whilst the size of ten specimens cannot be determined The majority of the bones show the yellowish red colour characteristic of "steaking", but one cannot be certain whether the meat was eaten by human beings Recurrent marks of chopping, as for instance on the lower part of the axis, show that the carcases were dismembered fairly professionally. But these marks are rather rare (being found only on 6 7 % of the bones) and only 1.1 % of the bones show traces of gnawing. The long bones have not been split for marrow in the systematic fashion common in European settlements Some of the bones probably belonged to animals accidentally burnt to death, e g the young bull in I B10. The almost complete skeleton of this beast was found and the bones on one side of the body are more charred than those on the other The fact that a large number of bones belong to immature animals demonstrates that the bones do not come from animals which have died from old age.

Small bovidae The domestic sheep and goat and the Indian gazelle are all represented at Rang Mahal, but it is not possible to refer the majority of the bones to their exact species The hundred and seventy-seven identified bones of small bovidae occur most frequently in layers I A7 and A9 but are otherwise fairly evenly distributed at all levels (in II they are very rare). The yellowish red colour predominates, but the olive-grey and brown colour may perhaps be due to the increased percentage of fat Many bones were splintered in antiquity and marks of the chopping and traces of gnawing are of greater frequency than with the zebu (11 5 % and 10 % respectively) It is evident that small bovidae were commoner food than zebu.

8 Domestic sheep, *Ovis aries* At least twelve specimens have been identified. The old rams have heavy, helixal, outwardly twisted horns (the horn-core from I B8, which is almost square in cross-section measures 46×31 5 mms when measured 47 mms above the base). When compared with modern Swedish breeds the metatarsals of the Rang Mahal sheep are longer, but they are not as long as those of the German Heidschnucke sheep. The presence of a large number of scapulae may be significant, as it is known that the scapulae of sheep were used, among certain asiatic peoples, by magicians

9 Domestic goat, *Capra hircus.* At least seven specimens have been identified. Finds of horn-cores indicate that the goats from Rang Mahal, which were fairly large in size, had short, twisted horns of a type known on certain Indian goats today Two astragali of small bovidae (goat?) are smoothed at top and bottom (they were used as dice here as in Greece and Rome astragalus=talus).

10 Indian Gazelle, *Gazella gazella bennetti.* At least thirteen specimens have been identified, represented mainly

TABLE VIII.

The occurrence of the most important bones in the different layers of trench I[1]

	Bubalus bubalus	Bos taurus	Small bovidae	Ovis aries	Capra hircus	Gazella gazella bennetti
Trench I						
A 6	—	+	+	+	—	—
7	?	+	+	+	+	+
8	+	+	+	+	—	—
9	?	+	+	+	+	—
10	—	+	+	—	—	+
11	—	+	+	—	—	+
12	?	+	+	—	+	—
13	—	+	+	+	—	—
14	—	+	+	—	—	—
Pit 4	—	+	—	—	—	+
Pit 5	—	+	—	—	—	—
Pit 9	—	+	—	—	—	—
Pit 10	—	+	—	—	—	—
A-A^V S	—	+	+	+	—	—
1	—	+	—	—	—	—
A^V 3	—	—	+	—	—	—
4	—	+	—	—	—	—
5	—	—	+	—	—	—
6	—	+	+	+	+	?
7	—	+	+	—	—	—
8	—	?	+	+	+	—
B 2	—	+	+	—	—	—
6	—	+	—	—	—	—
7	+	+	+	—	—	—
8	+	+	+	+	—	—
9	+	+	+	—	+	+
10	—	+	+	—	—	?
11	—	+	+	+	—	+
12	—	—	+	—	—	—
13	+	—	+	+	+	—
14	—	+	+	—	—	—
Pit 18	—	+	—	—	—	—

[1] Obs.! Not all bones are taken care of at the excavation. H.R.

by the characteristic horn-cores (male and female). They are found at all levels and indicate that gazelle hunting was popular in this area throughout Rang Mahal's history.

11. Domestic dog. *Canis familiaris.* Twenty bones belonging to at least seven specimens were found in layers I:A6, A8, A10, B8, B9, II:VII, II:15. All the specimens, save one, represent a medium sized dog which, judging by the best preserved example in A10, had remarkably straight and slender limbs reminiscent of the greyhound. But the incomplete material does not allow a more detailed study of the breed as there are for instance no crania, except the lower jaw of a puppy and one broken upper canine tooth. Indigenous, primitive greyhounds are known in India (e.g. the Rampoor dog), where they are necessary in hunting such swift game as onager, gazelle, hare and partridges on the open steppe. In I:B8 the remains of a smaller dog was found, perhaps a pariah dog. The fact that it was a cripple, with a sprained tarsal joint which, by knitting incorrectly, had caused changes to take place in other joints (e.g. the knee-joint), indicates that this was not a wild jackal. Such an animal would not, presumably, have survived in this handicapped condition.

TABLE IX.

The occurrence of the most important bones in the different layers of trench II[1]

	Bubalus bubalus	Bos taurus	Small bovidae	Ovis aries	Capra hircus	Gazella gazella bennetti
Trench II						
1	—	+	—	—	—	—
2a	—	—	—	—	—	—
7A	—	+	—	—	—	+
7[1]	—	?	—	—	—	—
7	—	+	—	—	—	—
9	+	+	+	—	—	—
10	—	+	—	—	—	—
11	—	+	+	—	—	—
12	+	+	+	—	—	—
13	+	+	+	—	—	+
15	+	+	—	—	—	—
16	—	+	+	—	—	—
P	?	+	—	—	—	—
H1 [2]	—	—	—	—	—	—
H3 [2]	—	+	—	—	—	—
H5 [2]	+	+	—	—	—	—
H6 [2]	—	+	—	—	—	—
H6 [3]	—	+	+	—	—	—
H7a[3]	—	+	—	—	—	—
H7 [6]	—	+	—	—	—	—
H9	?	+	—	—	—	—
VII	—	+	—	—	—	—

[1] Obs ! Not all bones are taken care of at the excavation H R

12 Cat, *Felis sp* Three bones of two specimens, one of which represents a small kitten, were found in I:A9 and I.B9 We cannot tell whether they belong to domestic cats or to one of the small, wild species of Indian cat (e g *Felis silvestris ornata*). The bones are not red (i e. marked by fire) and it is interesting to note that the bones of other wild animals occur at this point (A9) The occurrence of the domestic cat has been noted in such early contexts as Harappa (Piggott 1950).

13. Striped Hyena, *Hyaena hyaena*. Fragments of a skull of one specimen, of a dappled light and dark grey colour, were found in I·B8.

14. Indian Porcupine, *Hystrix leucura* Sixteen fragments of four specimens were found (mostly from I A9 but one bone from A10). One can only speculate concerning the congregation of so many specimens of this unsociable animal It is conceivable that they fell, while roaming at night, into the pit which can be seen in the section at this point It is also possible that this was their home (for most of them are young animals) and that they were suffocated here during a fire The bones show a certain pale red colouring

15. Hare, *Lepus dayanus* Thirteen bones of at least nine specimens were found concentrated in the levels I A7—9, A10, A'6, A'8 and B9. The colouration of most of the bones ranges between the normal, yellow, colour and grey The manner in which they are broken is reminiscent of the remains of the meal of a bird of prey The tibia has been gnawed by a rat

16. Indian House Crow, *Corvus splendens*. The left ulna from one specimen was found in I:A10 Its shape and colour indicates that this also probably was left by a bird of prey, perhaps an owl.

17. Brown Fish Owl, *Ketupa zeylonensis* or the great Horned-Owl, *Bubo bubo*? One specimen, from I A11, is

represented by a cranium, a humerus and a radius. It is between the Snowy Owl and the Ural Owl in size. According to SALIM ALI (1946) these birds commonly live in woods near Indian villages.

18. Grey Partridge, *Francolinus pondicerianus*. Nine bones from the extremities, representing at least five specimens, were found in I:A8, A9, A^{v}8, B8 and B10. Among these were tarsometatarsals, 40 mms. in length, with long, pointed spurs (one of these bones bore marks of cutting).

19. Black Partridge, *Francolinus francolinus*. A tarsometatarsal was found in I:B11. It was 46.7 mms. long and had the typical, blunt spur.

20. Desert Monitor, *Varanus sp.* (*griseus*?) Five bones, consisting of vertebrae, humerus and *dentals*, representing at least four specimens, were found in I:A7, A8, A10 and B11.

21. Sand Boa, *Eryx sp*. Fragments of two crania and several vertebrae were found in I:A^{v}8. Together with the desert monitor, this snake indicates the desert-like character of the Rang Mahal area at this period.

22. Tortoise. A costal fragment was found in I:A9.

23. *Cyprinidae*. A lower pharynx bone from a fish of the carp family (not the true carp), which cannot be more closely identified, was found in I:A Pit 9.

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AN EXAMINATION OF THE TEXTILE IMPRESSIONS ON THE VESSELS OF TYPE 9 AND THEIR MANUFACTURE.

BY

MÁRTA LINDSTRÖM.

Museum of Cultural History, Lund

A small group of vessels and potsherds with internal textile impressions were found at Rang Mahal. These impressions are always on the internal side of the objects. Pottery with textile impressions is known from many places, but then the impressions usually take the form of external decoration. Textile impressions on the pottery from Rang Mahal cannot have had any decorative significance, they are due to the method of manufacture. These pots were not thrown on the wheel but built up round a core covered with cloth. They were very plain and mainly used for cooking.

This study was undertaken in an attempt to discover the type of textile used. Plasticine impressions, which produced the positive design of the cloth that covered the core, was taken from the various sherds and revealed a series of loosely woven fabrics of both coarse and fine quality, carried out in "plain weave", the simplest of all weaving techniques. We then examined the problem as to whether vegatable or animal fibres were used in the weaving of these fabrics and whether the fabric had been attached to the vessel during firing and, if so, whether any fibres survived. Only a thorough-examination of the process of manufacture of the vessels could answer these questions.

A closer study of the pots revealed that they had been made from two hemispheres which had each been moulded over a core covered with cloth. The core was probably made from either wet clay, or dung, mixed with straw or grass. When two halves had reached a leathery consistency they were removed from their cores and joined together, either accurately or with slightly overlapping joints (fig. 123); the join was then covered with a clay wash. An applied band was then placed in such a position that the join was covered and the lower part of the vessel was then rusticated with a mixture of clay wash and crushed potsherds. Next an opening was cut in the top of the sphere and the rim was attached. Pots of this type, which have been fired at a low temperature, are not normally fired in kilns but in pits dug into the ground and covered with a mound of sand with three or four flues. The fabric was usually well-fired, but occasionally a darker core is seen in these fractures.

The Geological Institute at Uppsala examined the clay and reported as follows, "Analysis of the minerals in the clay revealed a certain quantity of illite and traces of laterite, the pottery is otherwise rich in quartz."

Using the method outlined above, a copy of one of these Indian vessels was made by the author. Clay was mixed with shopped straw to form two hemispheres, these were covered with a wet jute fabric. Clay was then rolled out into two slabs of suitable thickness, these were placed over the hemispherical moulds and smoothed down. The clay was allowed to dry to a leathery consistency and the vessel was assembled and finished as described above.[1] The kiln, in which the vessel was fired, was partly dug into a steep slope and partly built up. It was fired for five and a half hours and a temperature of between 700° and 800° C was reached. This produced a light, yellowish-reddish-brown fabric.

The cloth covering the mould must have been of a kind that is easily separated from the clay. As part of our experiment, impressions were taken on clay slabs from varying types of fabric — wool, cotton, linen and jute. These slabs were fired with the experimental vessel. The woolen material was soon eliminated, the coarse, frizzy woolen fibres adhered to the clay so that the cloth did not come away very easily. The straight, smooth fibres of fabrics made from linen and jute are easily pulled away from the clay. Cotton fibres, which are also frizzy, are

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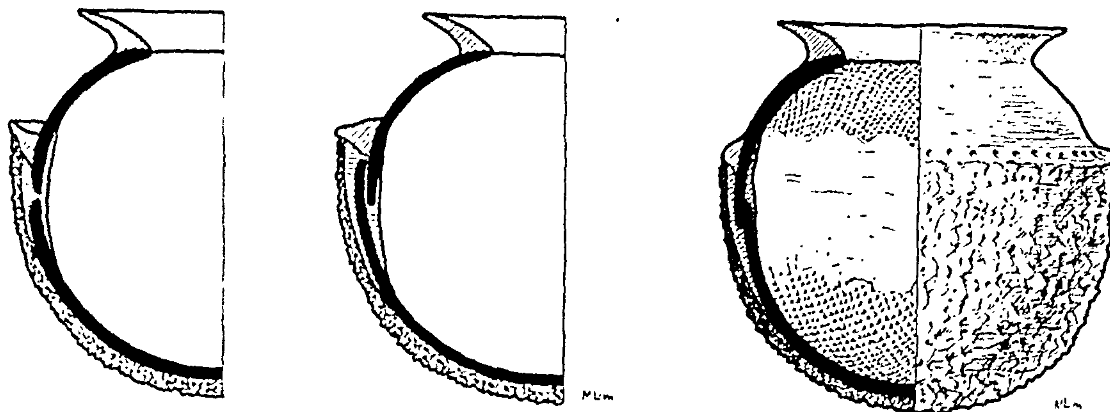


Fig. 123. 1/4. The process of the manifacture of vessels with textile impressions.

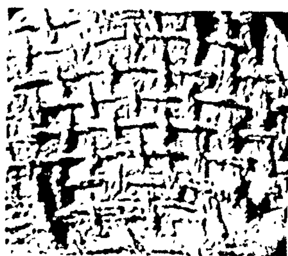


Fig. 124. 1/1. Impression of Swedish jute-textile.

very fine and can be spun to a firm, hard yarn. The capacity of the vegetable fibres for absorbing water is greater than that of woolen ones which makes them more easily detachable from the clay.

It was not possible in our experiment, however desirable it might have been, to use hand spun yarns of a looseness of structure similar to that found on the Rang Mahal vessels. We had to use fabrics obtainable in Sweden. AB Juteindustrier of Stockholm, supplied six pieces of material of different quality, the most loosely woven of which (5 oz. or 168 gram per square metre), fig. 124, most closely resembled the coarsest impressions found on the Rang Mahal pottery (fig. 70 and pl. 52:5,6,7,8). Finer impressions might result from other materials.

Some of the impressions reveal a fabric of more even structure; an even yarn of more circular cross section, which resembles cotton, can be seen in pl. 52:9,10,11. Other fabrics, too fine to be jute, resemble linen rather than cotton (pl. 52:12).

Fibres could be seen under a magnifying-glass after firing, but they disintegrated when touched. During our experiments the impressions on certain trial pieces were covered and protected by another slab of clay, but even in these cases the fibres disintegrated. All traces of fibres on the Indian pottery had naturally been rubbed off when the vessels were used, but in the hope that some information could be gained by a microscopic examination, samples of the pottery were sent to Svalövs Flax Laboratory.[1] Fragments of fibres were detached from crushed potsherds, but they proved to be too small for identification. It was the general impression in the laboratory, as of the author, that the fabric impressed on the Indian pottery might have been jute. This impression was based on comparison with modern sackcloth.

As a result of this study reasons can be given for the presence of textile impressions on the pottery. Secondly we can state that the fabric used in this process was made from a vegetable fibre. It seems most probable that these fabrics were made from jute or cotton, which occur so commonly all over India, but it is possible that other fabrics, such as hemp imported from other Indian provinces, were used. Perhaps simple linen fabrics of tow yarn was obtained in the same way.

[1] We must here acknowledge the generous help received in this matter from Fil. dr. Kåre Fröier and Mr. H. Zienkiewicz.

THE HISTORICAL AND GEOGRAPHICAL BACKGROUND OF RANG MAHAL

BY

BALLABH SARAN

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Rang Mahal — 'Colourful Palace or Palace of Enjoyment', is the name by which the site is known, and linguistically is of medieval origin, but none of the chronicles, ballads or bardic songs, which contain valuable material for reconstruction of the history of the Rajputs, give us any clue either to the period or to the magnificient builder who is supposed to have built such a "Palace" in a region which is now desolate and covered by sand-dunes all over, except for the ancient river bed, marked by a continuous stretch of alluvium 7 to 14 kilometers in width. The Rang Mahal village (Latitude 29°—21' N: longitude 73°—59' E of Greenwich) is within Bikaner territories of Rajasthan State. Before the merger in 1949, the State of Bikaner was ruled by a scion of the Rathor clan of Rajputs. The word 'Rathor' originates from 'Rashtrakuta', a power which gained supremacy towards the end of the eight century in the Deccan, South of the river Narmada and north of the river Krishna Rashtrakutas[1] were probably connected with Rashtrikas of the third century A.D noticed in the same region The wonderful Kailash Temple at Ellora was built by Krishna (756—75) who was a Rashtrakuta Rathor Rajputs may have been a branch of the Rashtrakutas who were expanding towards the north. At any rate the genealogical tables and chronicles maintained at Bikaner show that the present Kingdom which derives its name was carved out by one Rathor Rao Bika (Vikram), son of Rao Jodha of Jodhpur in 1435. Among the earlier tribes and races who inhabited these regions, mention may be made of Yaudheyas. The Yaudheyas after their Muslim conversion became Johiyas; and the region near Bhawalpur, on both sides of the Sutlej is called Johiyawar. But there is no doubt that the Yaudheyas were a very ancient and powerful race. The root of the word is from 'Yudh' — 'fight'. Panini[2], the famous grammarian (c. 8th century B C.) has mentioned the Yaudheya tribes in Southern Panjab. The Mahaksatrapa Rudradaman (c. 150 A.D) in his inscription at Girnar[3] mentions Yaudheyas as warriors among Kshatriyas Samudragupta (c. 335—385 A D.) in his Allahabad pillar inscription[4] records his authority over Yaudheya tribes. Yaudheya coins found mostly in Southern Punjab and northern Rajasthan are datable from 2nd century A.D. to 4th century A.D. and depict the war god Kartikeya and the name of the Commander of the Army. One inscription of the Yaudheyas in the sixth century style was reported from Vijayagarh fort in Bharatpur. The Yaudheyas then called Johiyas, were still in occupation when Rao Bika subjugated this country which was called Jangloo (jungle or waste land) at that time.

[1] A S Altekar *The Rashtrakutas and their Times*, Poona Oriental Ser no 36, 1934

[2] V S Agrawala *India as known to Panini*, Lucknow, 1953

[3] F Kielhorn, *Junagadh Rock Inscription of Rudradaman*, Epigraphia Indica, Vol 8, pp 49—52, 1905—06

[4] J F. Fleet, *Inscriptions of the Early Gupta Kings and their successors*, Corpus Inscriptionum Indicarum, Vol III, p 8, Calcutta 1888.

It would also be interesting to know how the state came to be known as Rajasthan or Rajputana and the ruling tribes as Rajputs. The Muslim Chroniclers have called the fighting races Rajputs and during the British period the territory was known as Rajaputana, though more correctly it should be called Rajasthan, "the place of Rajas or rulers". Rajput, derived from sanskrit Rajputra, means 'kings' offspring' and does not signify a race, but may be understood to mean the second caste among the Hindus viz., Kshatriyas.

The word 'Rajputra' occurs very often in early Sanskrit works, but unfortunately the dates of these works have not been fixed with certainty, because most of them, even when ascribed to single authors, suffer from later additions, alterations, and interpolations. Due to this 'continous growth' or due to the fact that when the works were reduced to writing in later times by unknown persons, (who thoroughly revised them and introduced matters relating to their own times), our task[1] of determining the dates of individual works is not an easy one. The word 'Rajaputra' occurs in the following works:

1. Kautilya's *Arthasastra* p. 32, ascribed to 4th century B.C. because Kautilya was a Minister of Chandragupta Maurya, grandfather of Asoka.
2. Kalidasa's *Malevikagnimitra* drama, Part V. p. 104, ascribed to 1st century B.C. or 4th century A.D.
3. Asvaghosha's *Saundrananda*, Sarga 1, ascribed to 1st century — 2nd century A.D.
4. Banabhatt's *Kadambari* p. 14—15, about 640 A.D.

Tod[2] has expressed the view that the Rajputs of Rajasthan may be regarded as branches of *Saka* tribes rather than *Kshatriyas* (who were part of the Aryan fold). He bases his argument on the basis of their myths, beliefs and practices which are akin to *Sakas*, e.g. worshipping the Sun, the practice of *Sati* (widow-burning), performance of the *asvamedha* (horse-sacrifice), worshipping the sword and the horse, and great addiction to wine.

This argument receives support from the existence of the rule of Gurjara or Gurjara Pratiharas[3] in Western and Central India from 7th to 9th century A.D. The Gurjaras, now represented by the existence of a considerable population of Gurjaras in the same region, are supposed to be the descendents of the Huns who poured down in India about the 5th century A.D. The Huns are in turn associated with Sakas, Kushans and Scythians. It is generally believed that they belong to the same stock, and had come from Central Asia during different periods, but their individual characteristics and exact identifications are still not clear. The Indian Literature and inscriptions also do not contain a detailed account of each branch though there are innumerable references and sometimes with geographical context relating to the problem of the Sakas in India with which the "Rang Mahal culture" seems to be connected.

The materials recovered from the Rang Mahal site from earlier sporadic excavations show clear affinity with the archaeological finds in the Gandhara region. The most interesting pieces which

[1] For discussions see: — J. N. Farquhar: *An Outline of Religious Literature of India*, Oxford 1920. R. W. Frazer: *Literary History of India*, London 1898. P. V. Kane: *History of Dharmasastra* — Three volumes, Poona 1930, 1941, 1946. A. A. Macdonell: *History of Sanskrit Literature*, London 1900. F. Max Müller: *History of Ancient Sanskrit Literature*, London 1860. C. V. Vaidya: *History of Sanskrit Literature*, Poona 1930. A. Weber: *History of Indian Literature*, London 1882. M. Winternitz: *History of Indian Literature*, Calcutta 1927.

[2] James Tod: *Annals and Antiquities of Rajasthan*, Vol. I Chap. 6, Oxford 1829.

[3] R. C. Majumdar: *The Gurjara-Pratiharas*, Journal of the Department of Letters Vol. X, Calcutta University 1923.



1



2



3



4



5



6

Fig 125 About 1/6 Terracotta plaques, according to the tradition from Rang Mahal, now in the Museum of Bikaner (cf p 206)

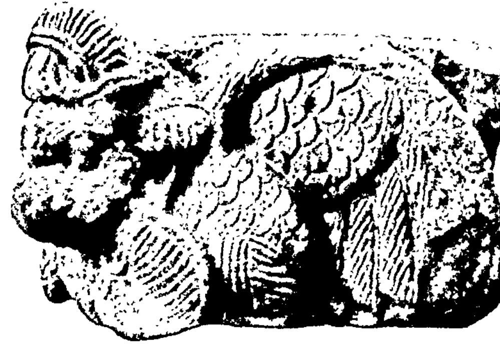
1) A monster with bovine head, human bust and an elephantine foot, 2) Lord Krishna in the act of uplifting the mount Govardhana, 3) A rural idyllic scene, 4) Mahadeva workship, 5) A saint, 6) Siva and Parvati

Fig 1—3, 6 are reproduced in An Rep Arch Surv Ind 1917—18, pl XII 6, XIII 1—3

have now been removed to Bikaner, include fragments of cornices, frames and friezes with acanthus leaf chequered, and representations of animal figures: a winged crouching Garuda (fig. 126:2), a monster with bovine head, human bust, and single elephant foot (fig. 125:1) and an elephant carrying on his back a man in prone position are especially noteworthy. In all these fragments the influence of the Gandhara school is very apparent (fig 126:1).



1



2

Fig. 126. 1. About 1/6. Terracotta plaque with an elephant, carrying a prone man on his back. 2. Terracotta fragment with a chrouching Garuda. After An Rep. Arch. Surv. Ind. 1917—18. Pl. XII: 7 and 5.

According to local tradition the brick materials of which the Suratgarh Fort is built, originally came from Rang Mahal. From the same village apparently came three very interesting terracotta panels, which were lying in a small chamber in the Bikaner Fort. These include: Krishna in the act of uplifting the mount Govardhana, an idyllic scene between a man and a woman standing under a tree and Siva and Parvati, fig. 125:2,3,6.

Ten more terracotta reliefs still more interesting and unique in their way, representing male and female figures from the waist upwards in various attitudes, were recovered from Baropel, a village 7 miles North-east of Rang Mahal. "A general and very characteristic feature of all these reliefs" says, Dr. Tessitori, "is the classical treatment of drapery and of the hair, which at once betrays, the influence of the Gandhara school. The men are represented bare-headed and beardless, with naked busts except for a collarlike ornament round their necks, and a sort of narrow scarf thrown over one or both their shoulders. The females are represented variously, but most with naked or half naked busts, only partially covered by a scarf hanging from their head down the back and gathered up over the arms, and partly Indian and partly classical ornaments. The most striking classical feature of these reliefs is perhaps the bodice worn by the women, which, with its short sleeves and armour-like decorations, has a very marked Roman appearance[1]".

[1] An. Rep. Arch. Surv. Ind. 1917—18, p. 22 f.

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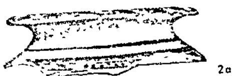
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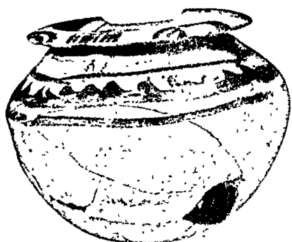
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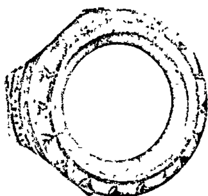
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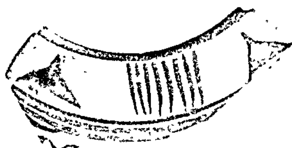
Literature concerning the Mollusca Found cf. p. 195

Literature concerning the Bone Fragments cf. p. 200



















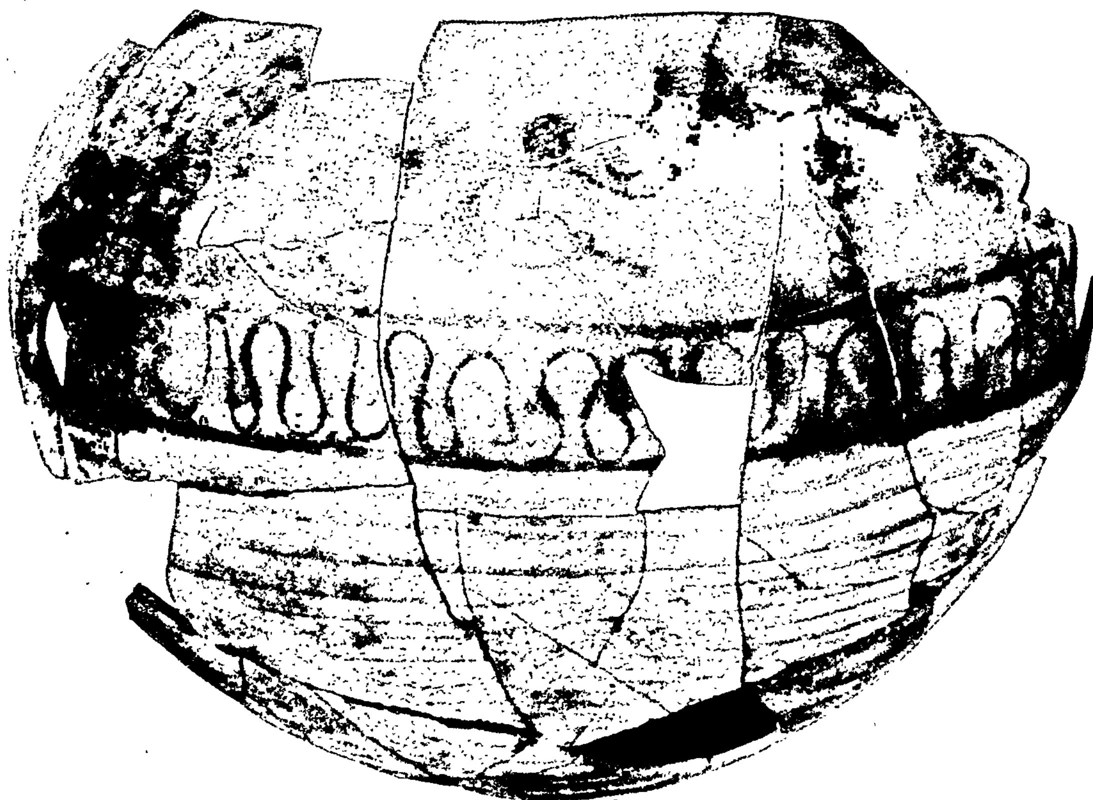




1/3 Globular pots Type 1 Bd
1) (fig 56 1) I A Pit 10, 2) (fig 56 2) II 1, 3) I A S, 4) (fig 56 3) I B Pit 17, 5) I A^{v}3, 6) II 5A, 7) II.12, 8) II X, 9) II 2A, 10) II 1

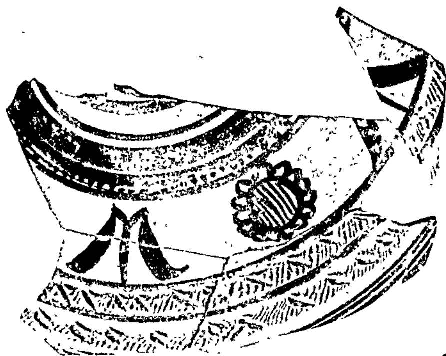


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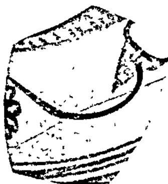
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1/4. Globular pots.
1) I:A^v Pit 20; 2) I:B Pit 14.

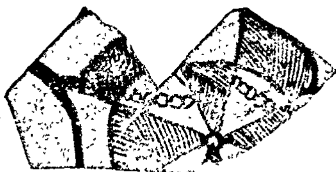




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1/2 Fragments of painted globular pots
1—2) I B8, 3) I A1, 4—5) S

Pl. 34.



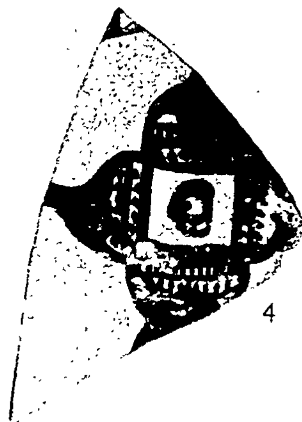
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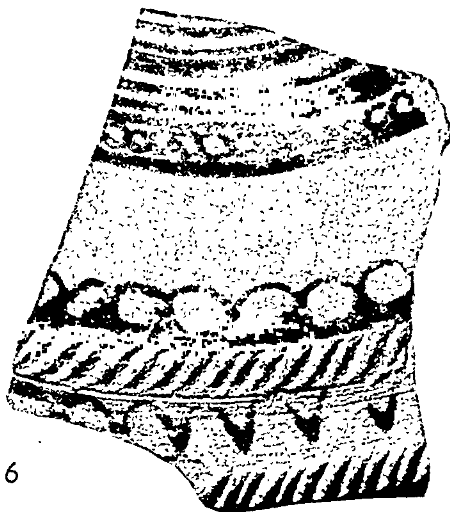
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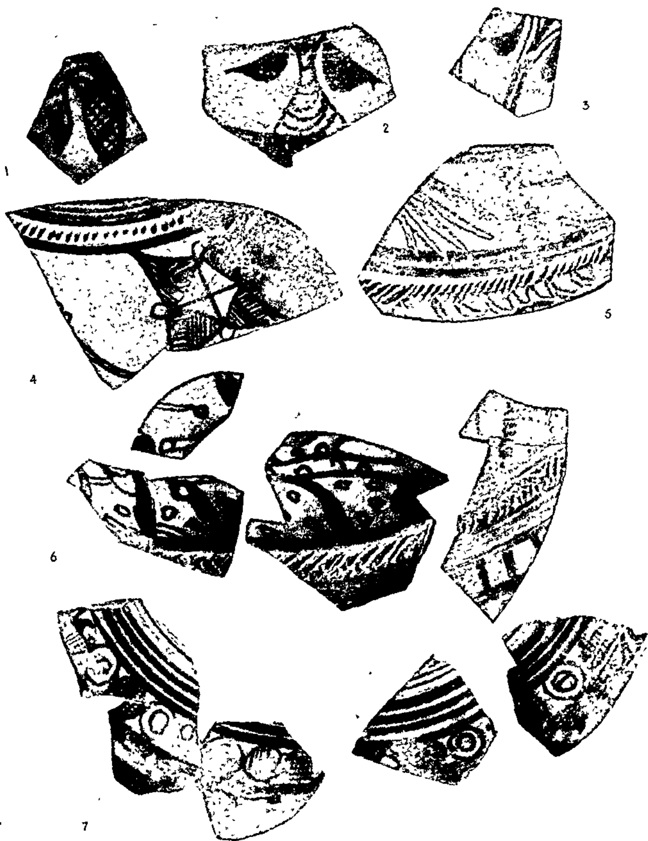
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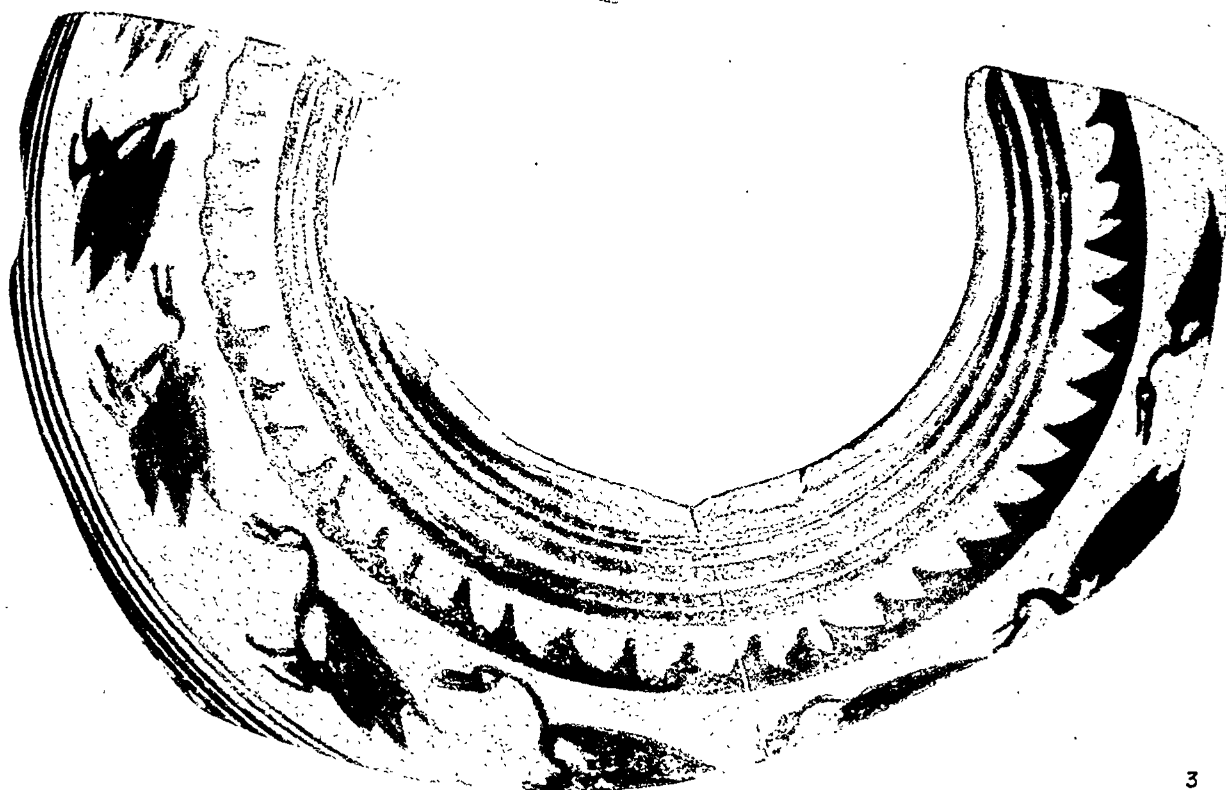
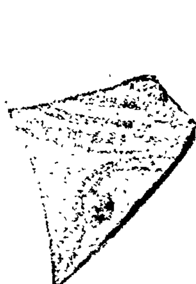


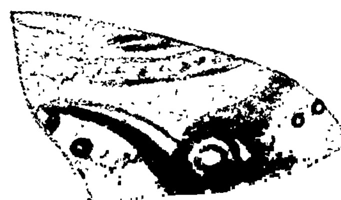
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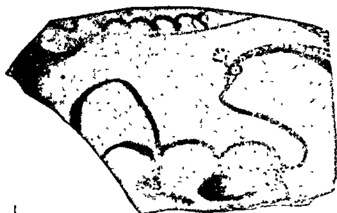
1/2 Fragments of painted globular pots
1—2) II 1, 3) II V, 4) I A Pit 9 5) I B Pit 17, 6) II II, 7) II 12



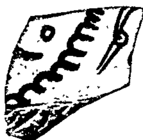


1) 1/1. 2—4) 1/2. Fragments of painted globular pots.

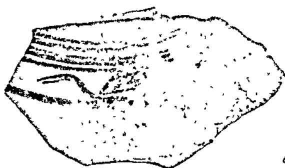

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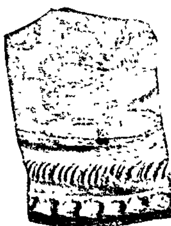

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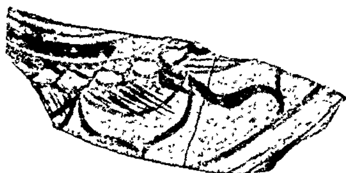

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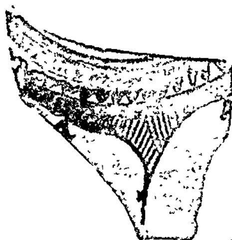

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1/2 Fragments of painted globular pots
1) II·1, 2) II $H5^2$, 3) II H8, 4) II $H5^2$, 5) II VII, 6) I A Pit 9, 7) S, 8) II $H7^1$, 9) I.B6, 10) I B2, 11) I B9

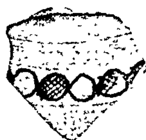


1/2. Fragments of painted globular pots.
1) I:A6; 2) I:A9; 3) II:1; 4) II:6; 5) II:15; 6) II:1; 7) I:B2; 8) I:B4.



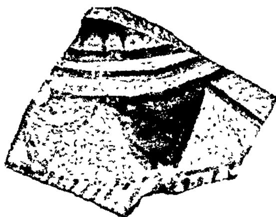












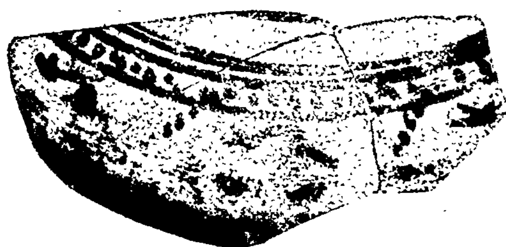




1/2. Fragments of painted globular pots
1) II H6; 2) S, 3) II VI, 4) I.B9, 5) I B8, 6) II 8, 7—8) red paint, S, 9) red paint, II 15



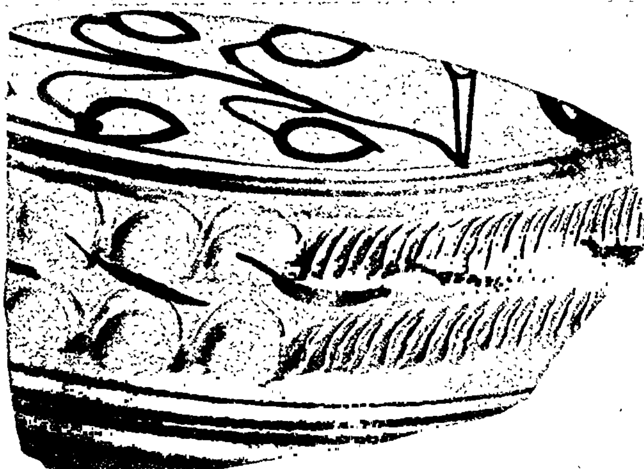
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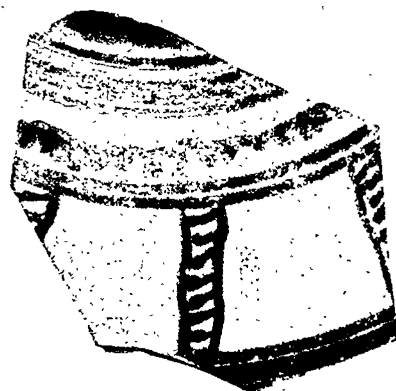
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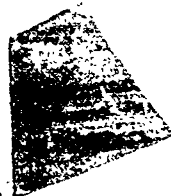
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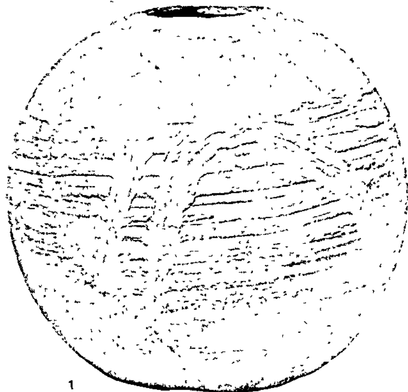
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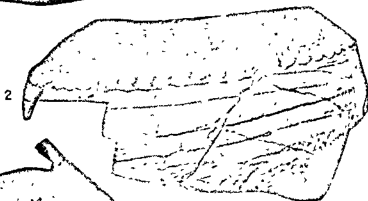


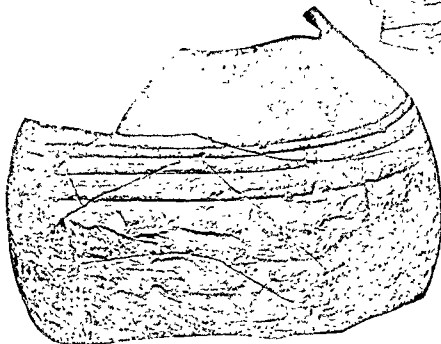
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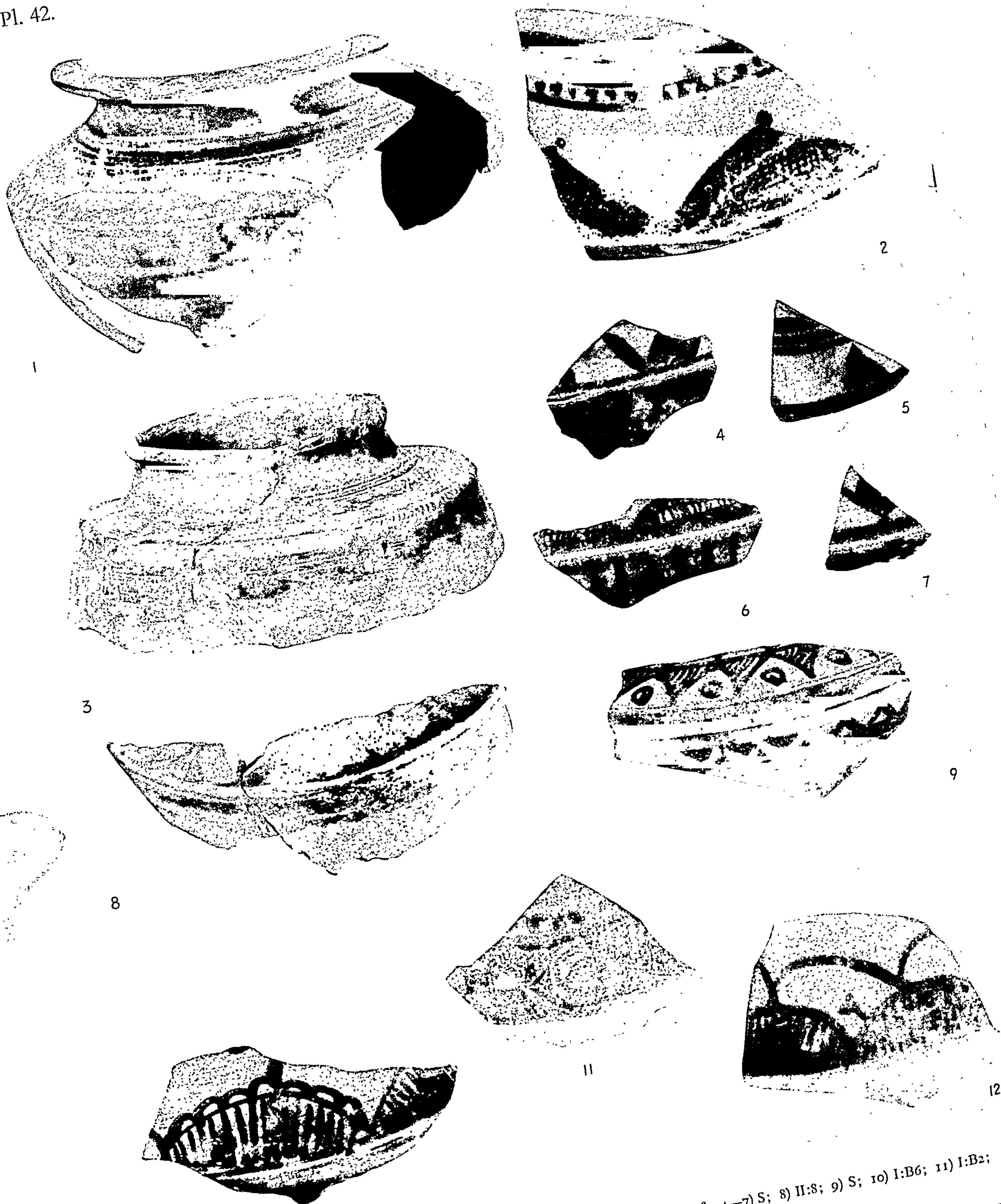




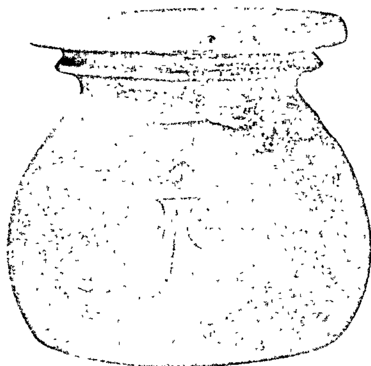


1/4 Fragmentary globular pots
1) I A14, 2) I B Pit 18, 3) I A^{V} Pit 20

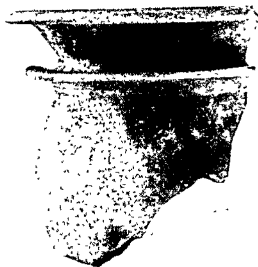
Pl. 42.



1/2. Carinated pottery. Type 2.
1) Fragments of the same pot are found in I:AS, A Pit 4, Pit 9, Pit 12; 2) S; 3) II:H4^{2}; 4—7) S; 8) II:8; 9) S; 10) I:B6; 11) I:B2;
12) I:B2.







ca 1/2 Flask-shaped pots Type 3
1) (fig 66 1) I A^V Pit 20, 2) (fig 66 2) I B Pit 14, 3) I B Pit 14



1



2



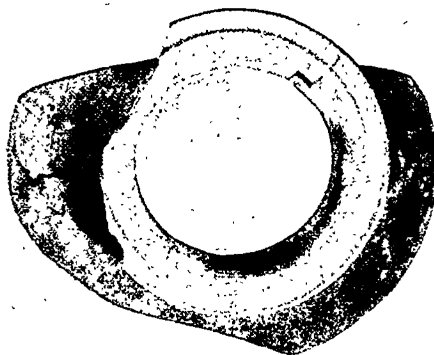
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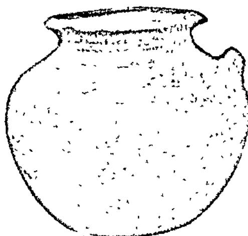


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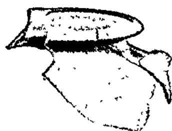
1/3. Spouted jars. 1—4) Type 4 A.
1) (fig. 67:1) I:B10; 2) I:B11; 3) I:B8; 4) I:A^{V} Pit 20; 5) I:B4; 6) I:A^{V}7.



1



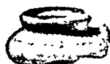
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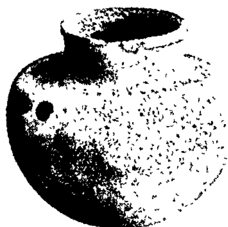
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9

1/3 Spouted jars, Type 4 Variants cf p 108
1) (fig. 67 4) I 11 B, 2) I A'2, 3) (fig 67 2) A' Pit 20, 4) II 10, 5) I·A1, 6) (fig 67:3) II 1; 7) I A'5, 8) I·A Pit 1; 9) II.H2.



1/3. Spouted jars. 1) Type 4. Variants cf. p. 108.
1) I:B5; 2) (fig. 67:6) I:A^{V} Pit 20; 3—4) I:A^{V} Pit 20; 5) II:13; 6) I:A^{V} Pit 20; 7) I:B7.



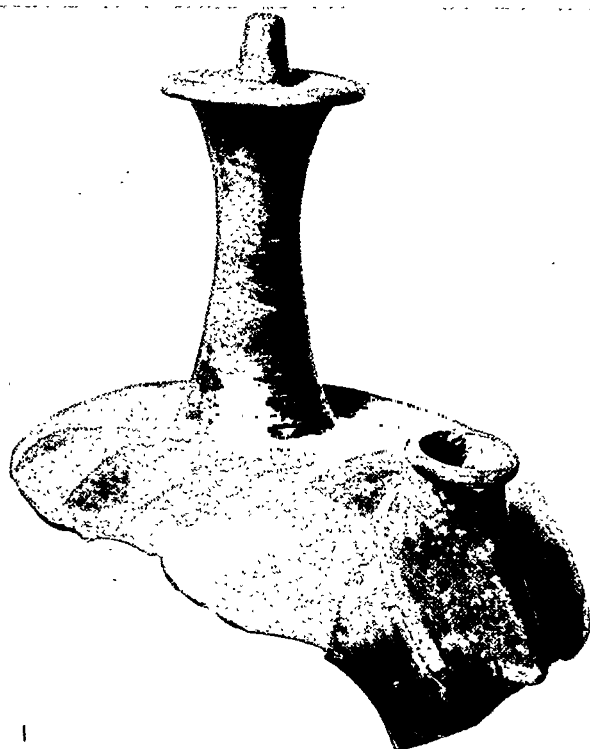
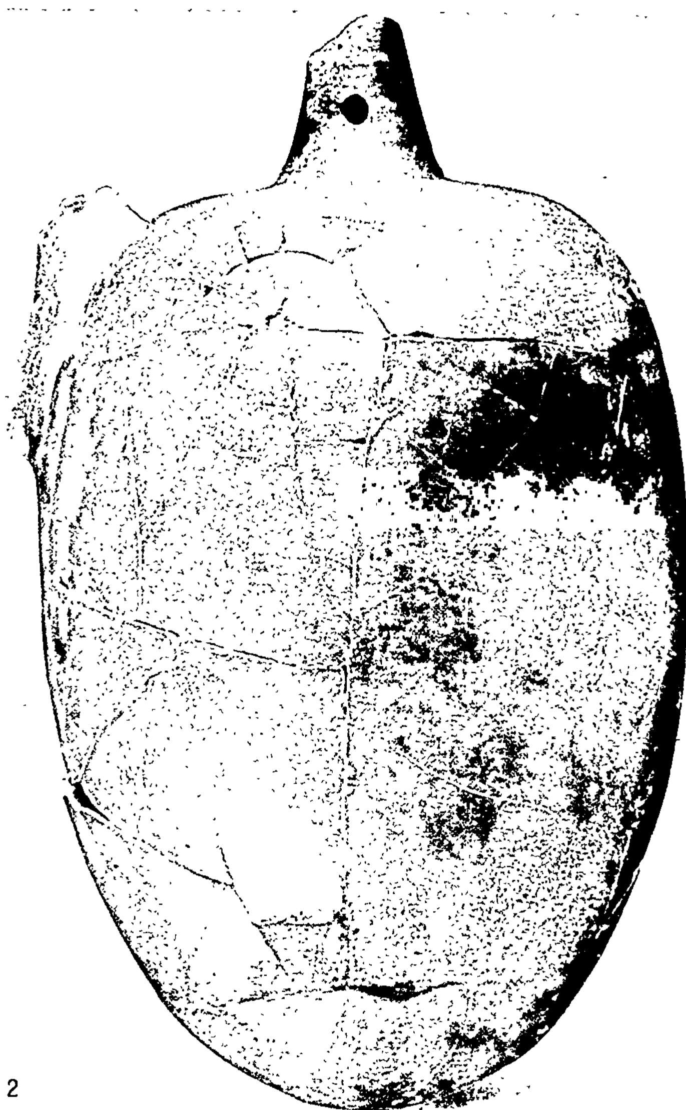
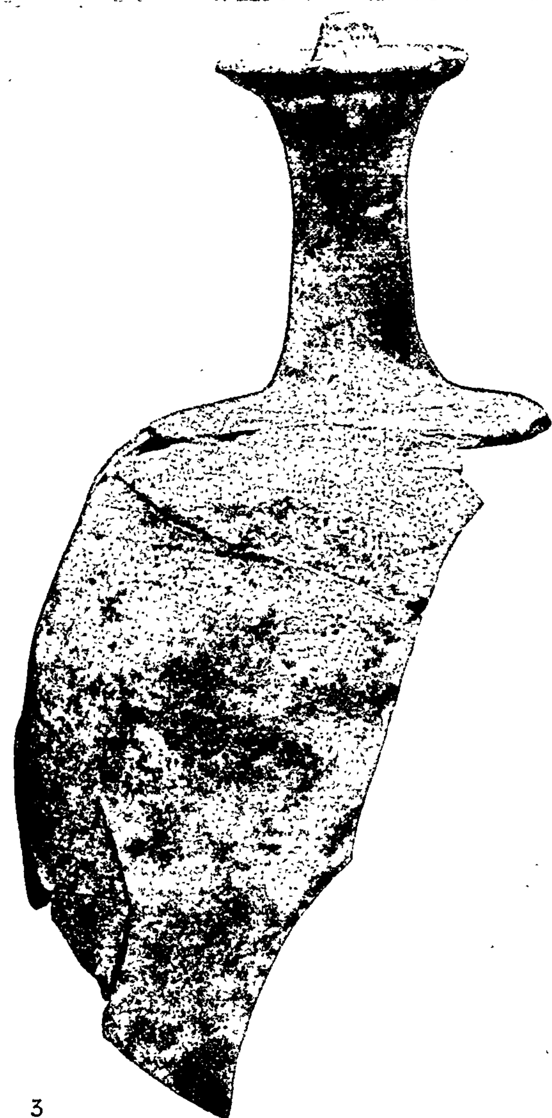
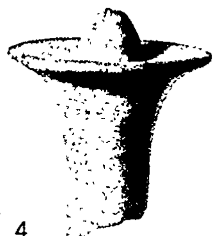
1—10) 1/3, 11—16) 1/2 Spouted jars Variants cf p 109, 110
1) (fig 67 7) I A1, 2) (fig 67 8) I A1 3) I A'3, 4) (fig 67 10) II H6, 5) (fig 67 11) I B Pit 18, 6) I A2, 7) I A4, 8) I A Pit 10, 9) (fig. 68 8) I A 5, 10) I B7, 11) I A6, 12) II IV, 13) II I 1, 14) II 11C, 15) II 1, 16) (cf pl 82 55) II H5[1]



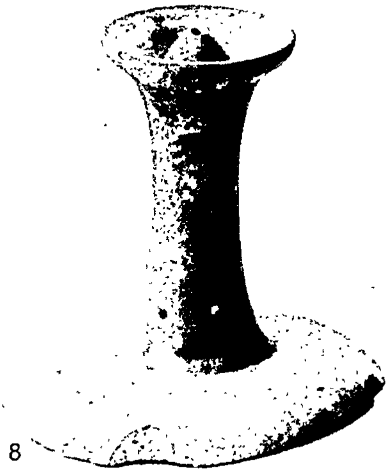
1/3. Spouted jars. Type 4 H.
1) (fig. 68:9) I:B Pit 14; 2) (fig. 68:10) I:B9; 3) I:A11; 4) I:B8; 5) I:B8; 6) I:B9; 7) I:B2; 8) I:B9; 9) I:A^{V}6; 10) I:A^{V}8;



1/2 Sprinklers 1—4, 6—11) Red Polished Ware [illegible]
1) I A 7; 2) (fig. 68 1) I B9 3) I B4, 4) I B[illegible] 5) [illegible] 6) (fig. [illegible]) I A[illegible] 7) I A11, 8 9) I A[illegible]
11) I A12; 12) I B7, 13) I A[illegible]



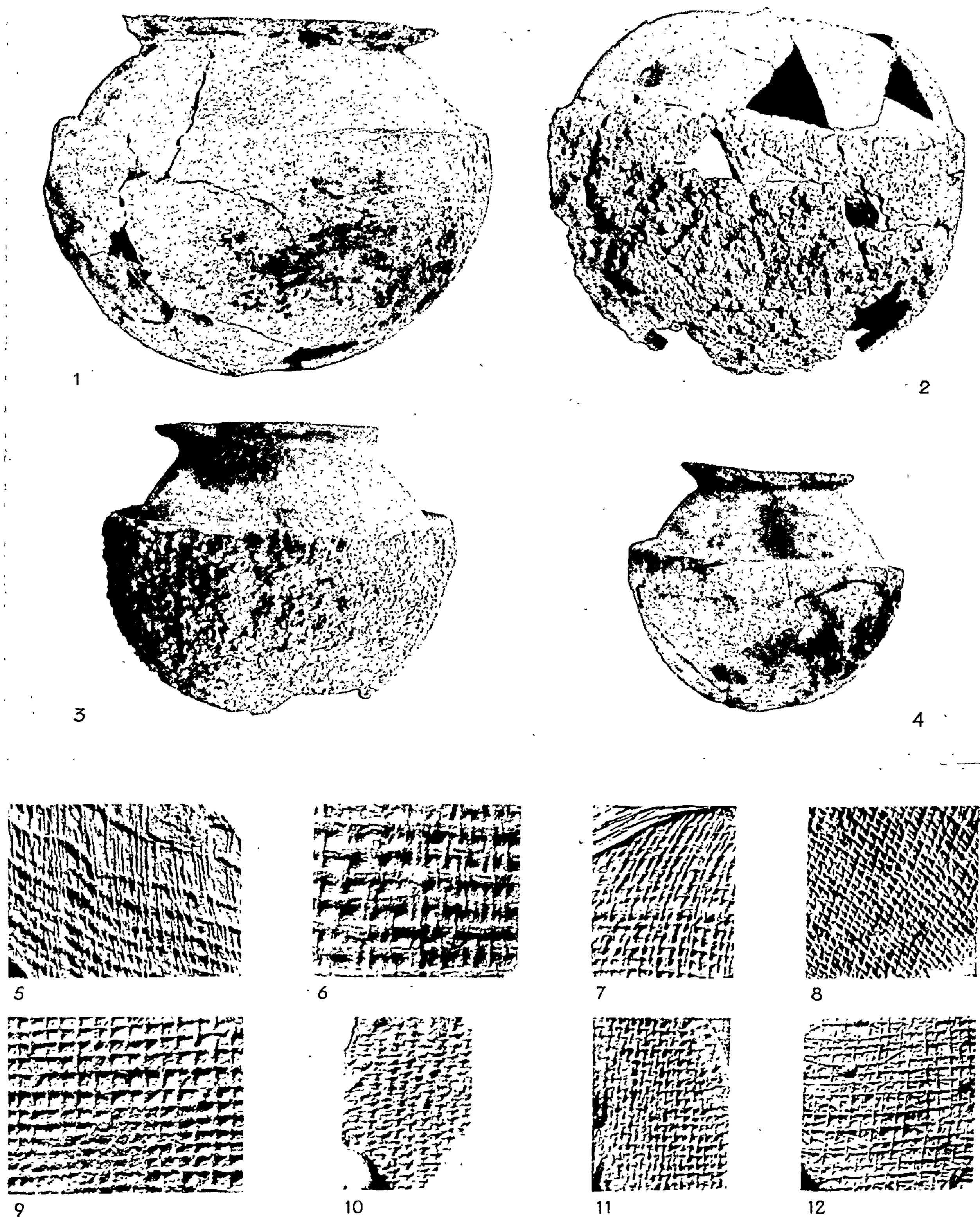




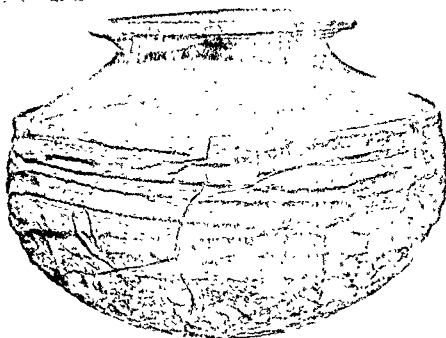
1/2. Sprinklers. Red Polished Ware. Type 5B.
1) (fig. 68:4) II:15; 2) S; 3) I:B6; 4—5) I:A8; 6) S; 7) I:A11; 8) I:B9; 9) I:B9; 10) I:A5.



1/2 1—2) Necks of sprinklers, 3) unique bottle Type 8, 4—5) pots of stovelike shape. Type 7, 6) vase. Type 15B, 7) grey sprinkler Type 6
1—2) I A'4, 3) I A5, 4) (fig 69) I B6, 5) S, 6) I.A'8, 7) S.



1—4) 1/4. Pots with textile marks. Type 9; 5—12) 1/1. Textile impressions, details.
1) (fig. 70:1) I:B5; 2) I:B14; 3) II:P^2; 4) II:$H7a^3$; 5) I:B14; 6) Sardargarh; 7) I:B12; 8) I:A^v6; 9) I:B14; 10) S; 11) Bhamantheri; 12) II:13.



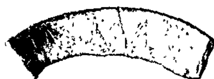
1



2



3

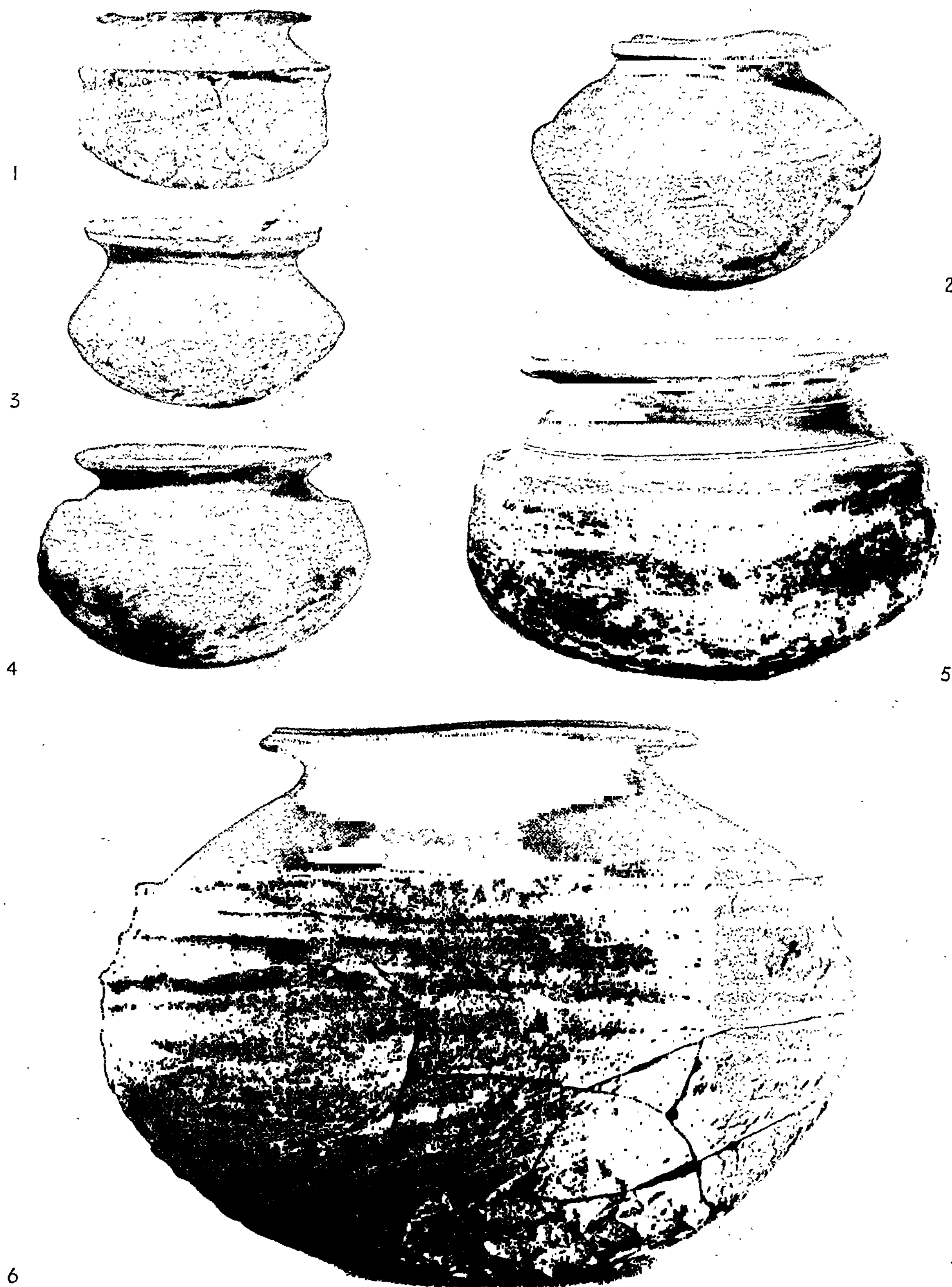


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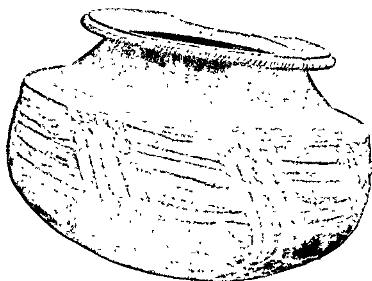


5

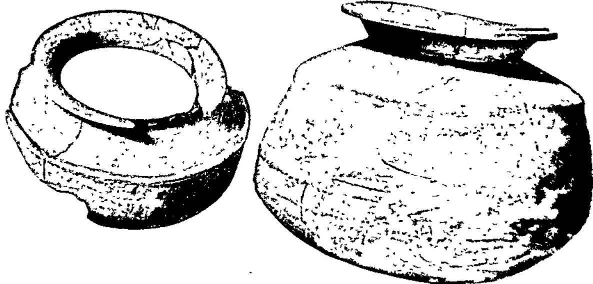
1/3 Cooking-vessels Type 10 A.
1) (fig 71 19) I:B Pit 18, 2) (fig 72 5) I A^{v} Pit 20, 3) I B Pit 18, 4) II 11 C^{2}, 5) II.1.



1/3. Cooking-vessels. Type 10 A.
1) II:1; 2) (fig. 71:2) I:A7; 3) (fig. 71:1) I:B13; 4) (fig. 71:3) I:B Pit 17; 5) (fig. 71:20) I:A^{V} Pit 20; 6) I:B Pit 14.



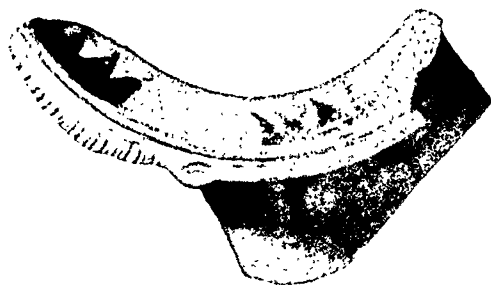
1



2

3

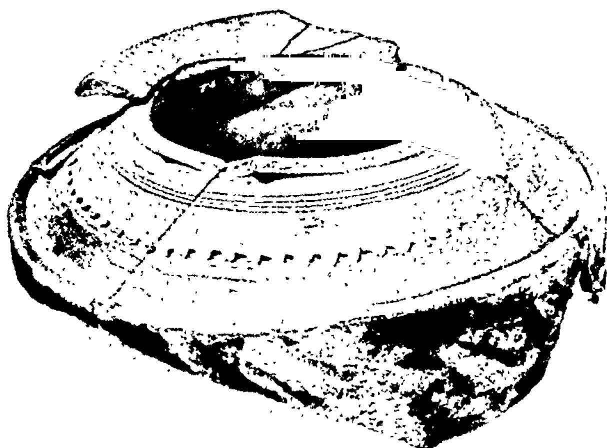
1/3 Cooking-vessels 1—2) Type 10 B, 3) Type 10 A
1) (fig 72 1) I AV3, 2) I AV Pit 20, 3) (fig 72 4) I B14



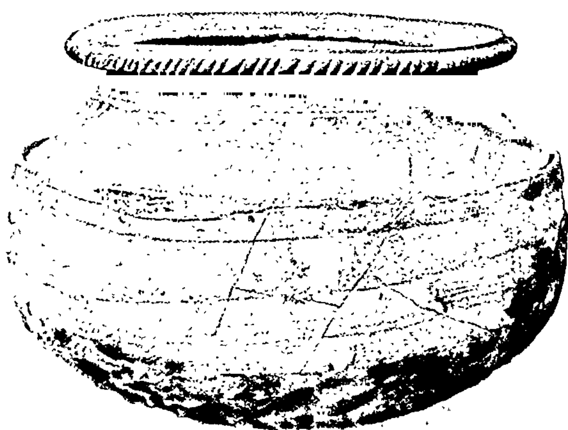
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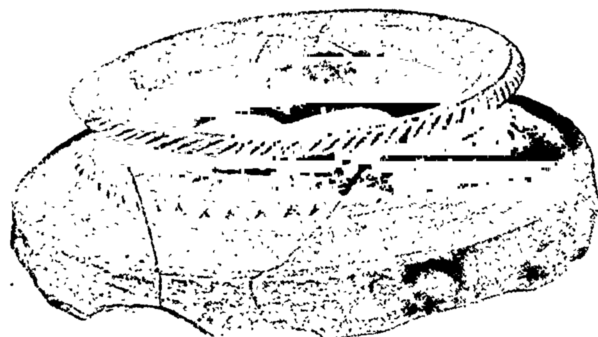
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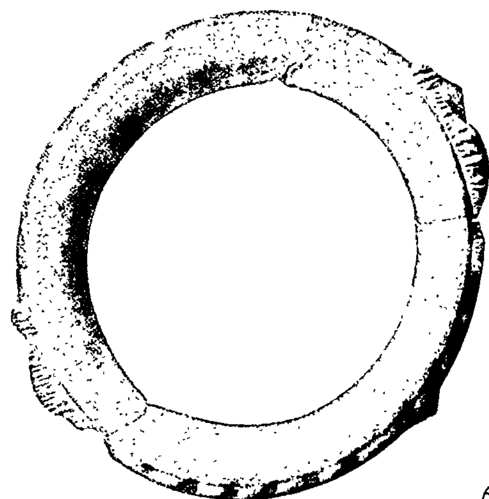
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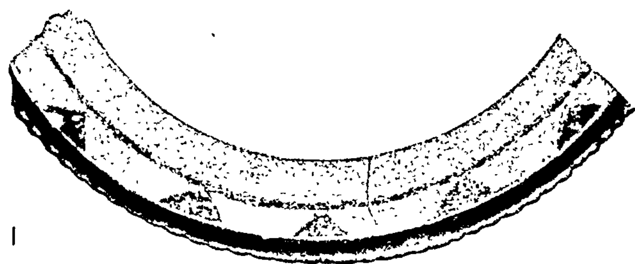
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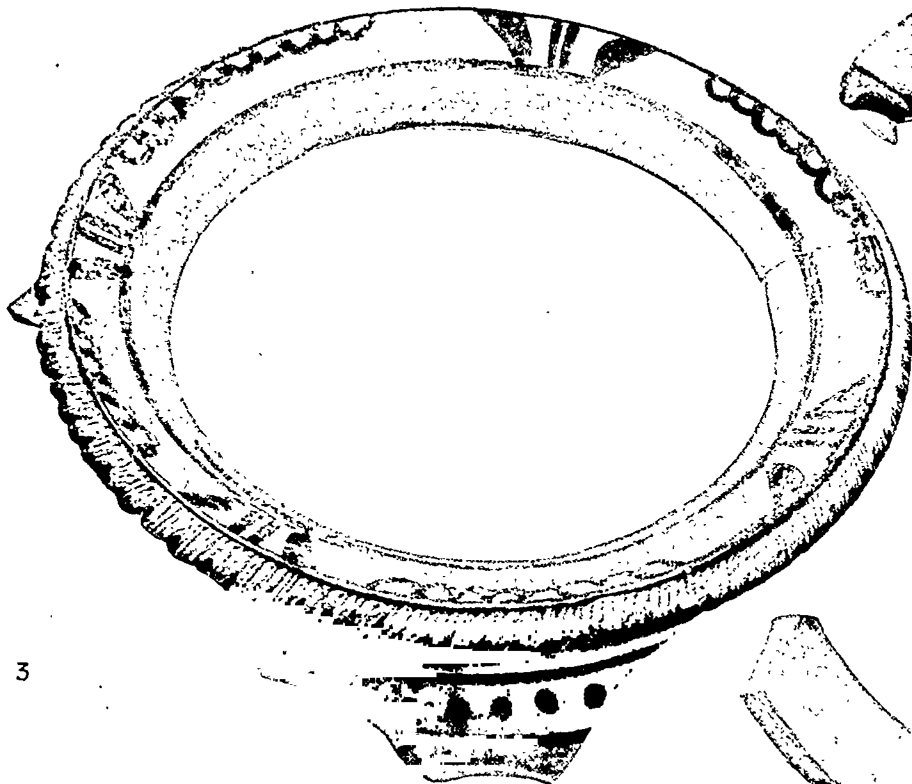
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1/3. Cooking-vessels. Type 10 B.
1) II:H10; 2) I:A^{V} Pit 20; 3) (fig. 72:12) A^{V} Pit 20; 4) (fig. 72:3) II:H4; 5) II:1; 6) I:A Pit 10.

1/2 Fragments of cooking-vessels Type 10 B
1) I A^v Pit 20, 2—7) II 1, 8) I A^v Pit 20

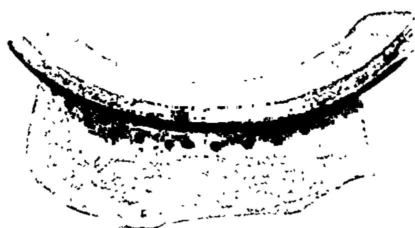




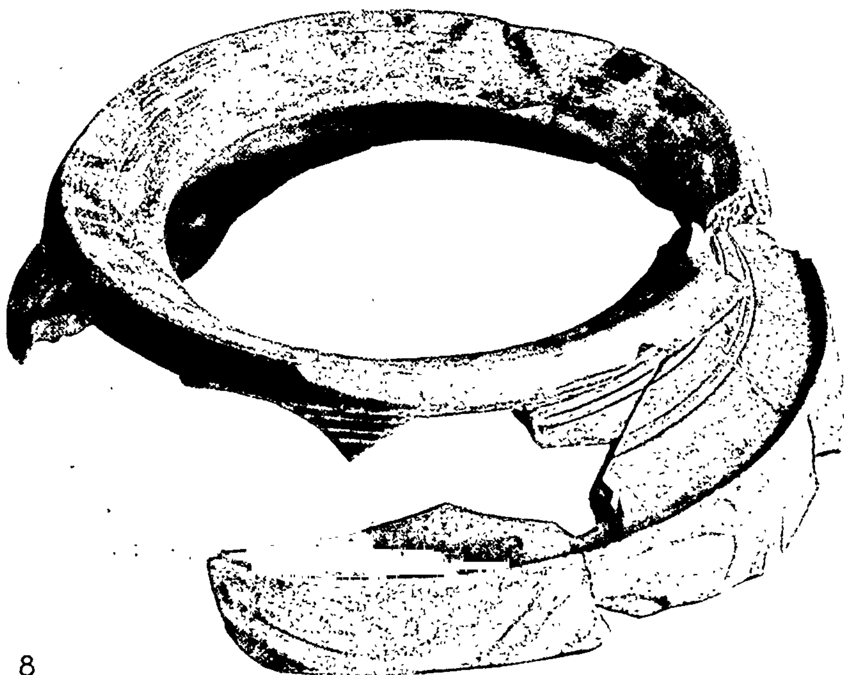










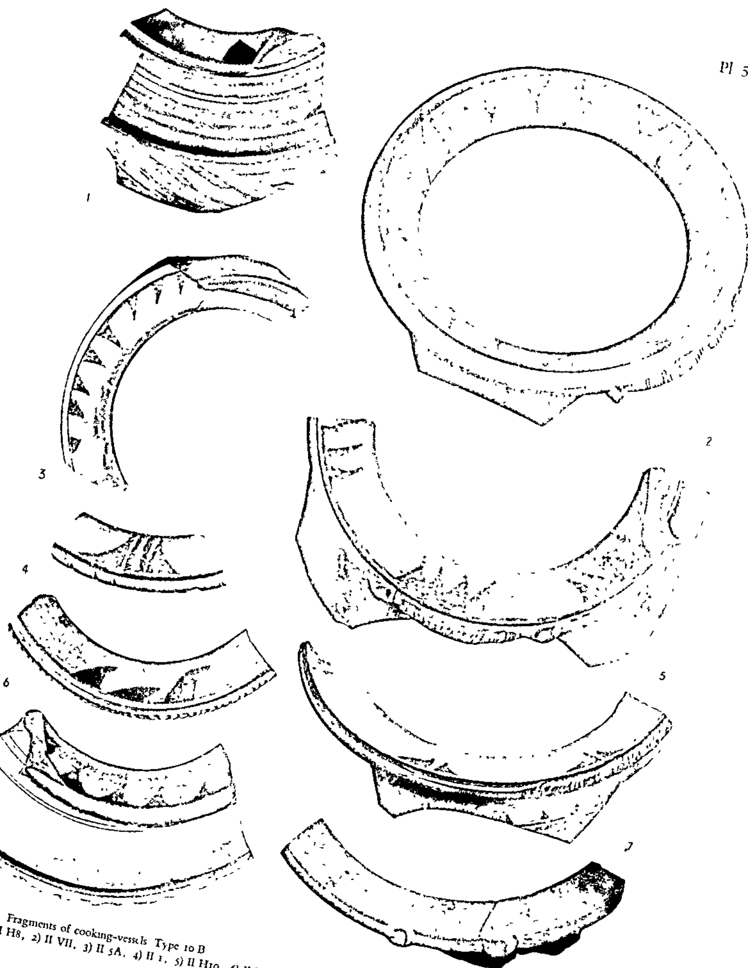




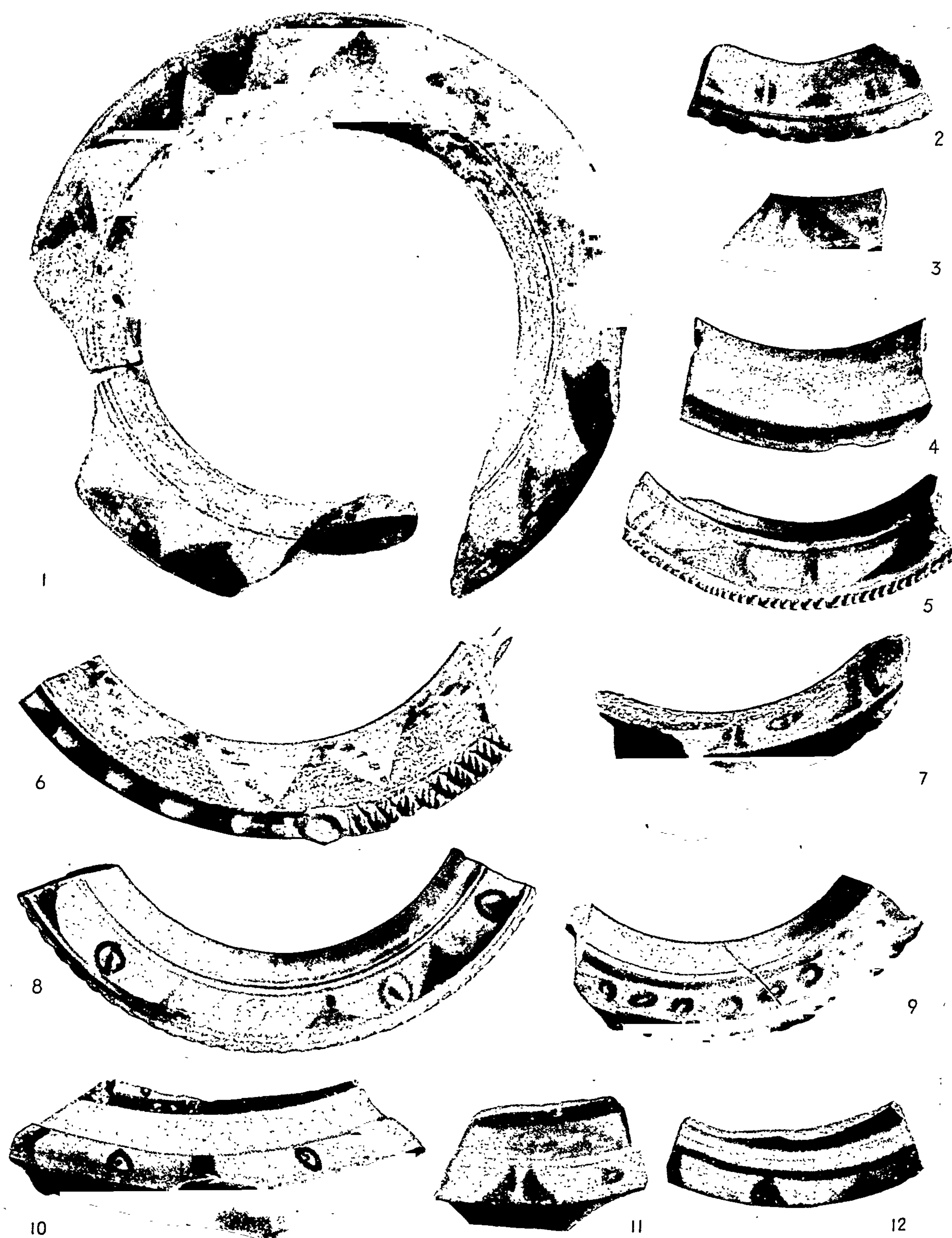




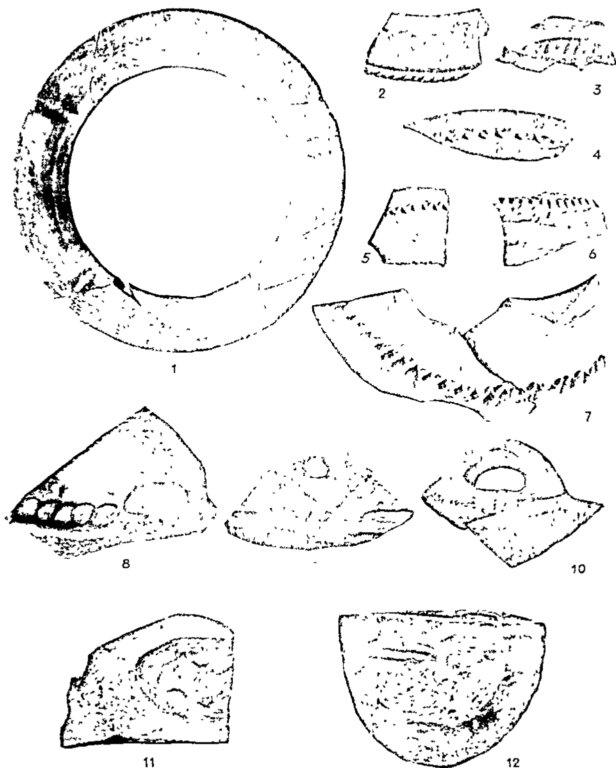
[illegible]. Fragments of cooking vessels. Type 20 B



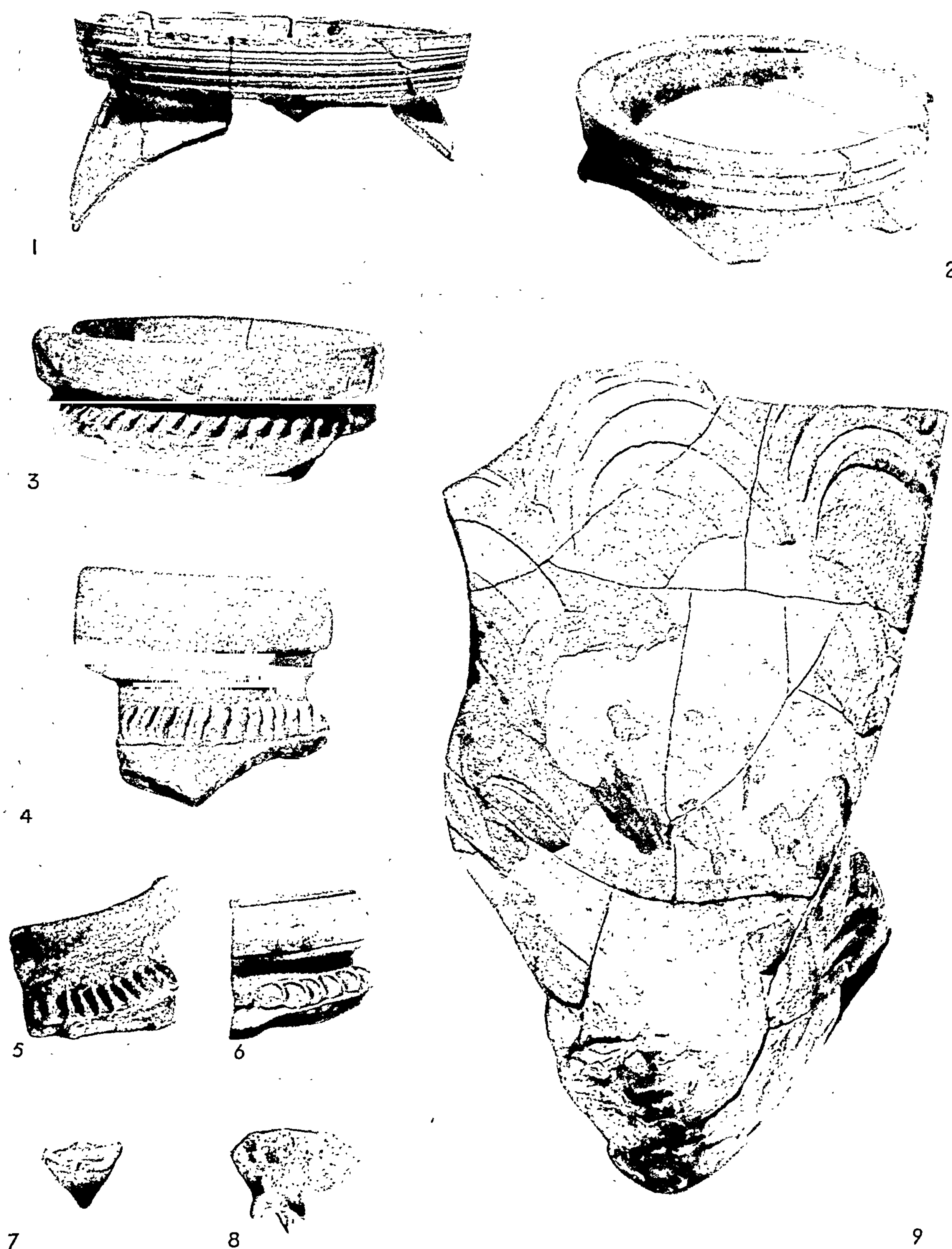
Fragments of cooking-vessels Type 10 B
I H8, 2) II VII, 3) II 5A, 4) II 1, 5) II H10, 6) II H7[1], 7) II 1, 8) II 8, 9) II P



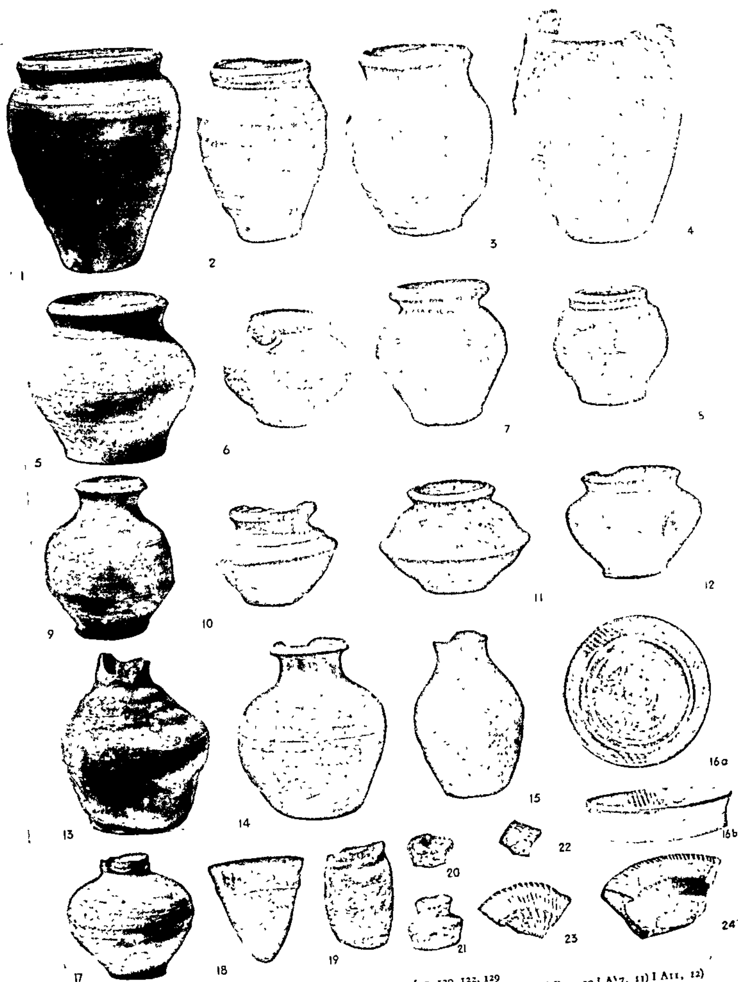
1/2. Fragments of cooking-vessels. 1—9) Type 10 B; 10—12) Type 10 B 1.
1) II:11; 2—3) II:1; 4) II:IV; 5) II:VII; 6) II:4a; 7) II:1; 8) II:2A; 9) II:1; 10) S; 11) II:IV; 12) II:1.



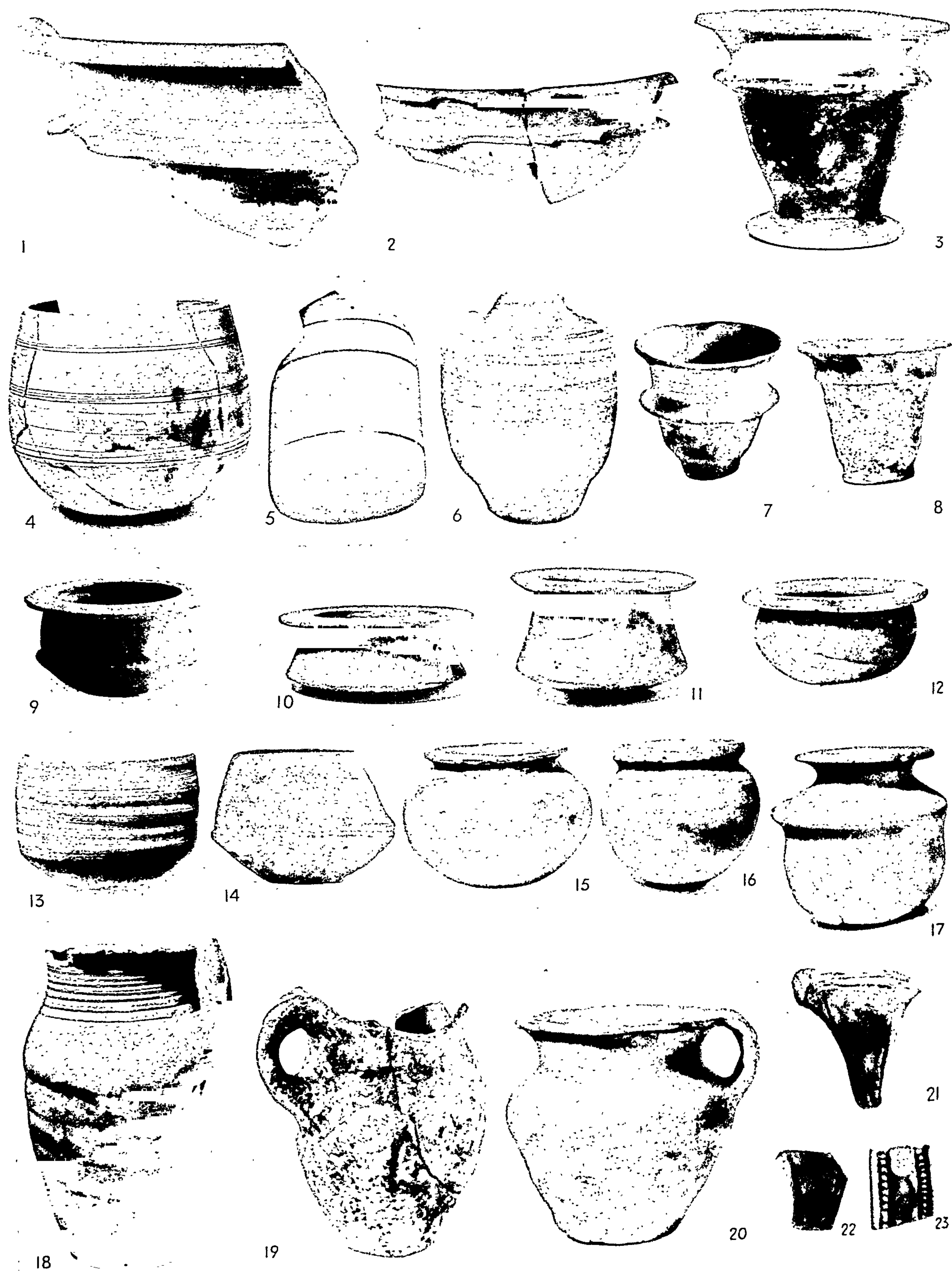
1—11) 1/2 12) 1/6 1—8) Fragments of cooking vessels, 9—10) loop-handles of pans(?) Type 11, 11) fragments of cooking-vessel(?), 12) cooking-vessel Type 10C
1) II H1; 2) II H4², 3) II 1, 4) II V, 5—6) I A7, 7) I B7, 8) I A13, 9) I B9, 10) II V, 11) I B9, 12) (fig 74) II 4²



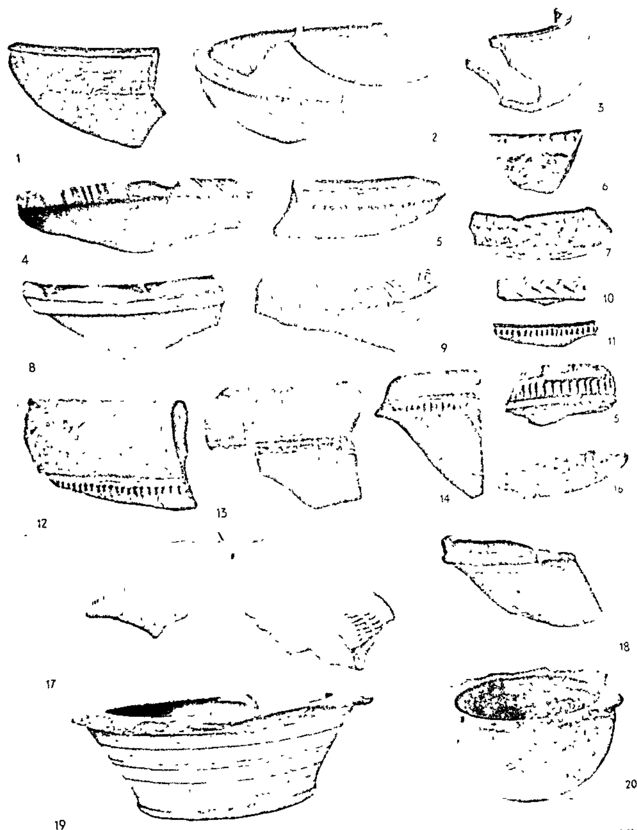
1/4. 1—6) Fragments of storage jars. Type 12. Variants cf. p. 118; 7 and 9) jars with pointed bases. Type 13; 8) tripod vessel. Type 14. 1) (fig. 77:6) II:IV; 2) I:B14; 3) (fig. 77:2) I:B14; 4) (fig. 77:1) S; 5) I:B Pit 17; 6) (fig. 77:3) S; 7) II:1; 8) I:B Pit 14; 9) (fig. 79) I:A5.



1/2 Small vases, toys and small plates Variants of types 16 and 22, cf p 120, 122, 129
1) (fig 81.1) I B11, 2) I A4, 3) II H8, 4) I A5, 5) I A^v8, 6) I A^v4, 7) I.A^v8, 8) I B8, 9) I B11, 10 I A^v7, 11) I A11, 12)
13) I A12, 14) II P, 15) I B9, 16) I B12, 17) II 2A, 18) I A3, 19) I B14, 20) I B12, 21) I B13, 22) I A^v3, 23—24)

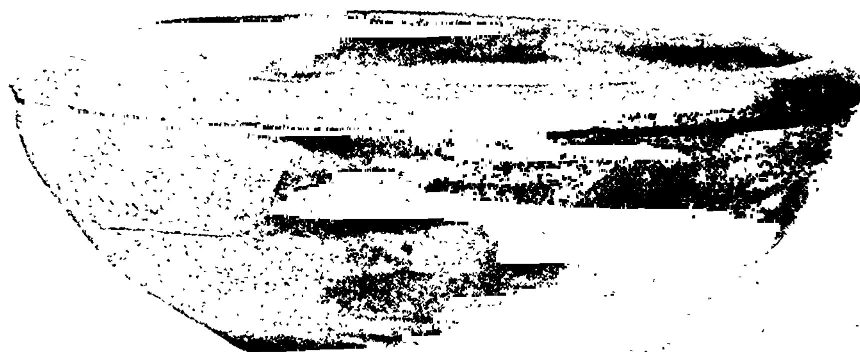


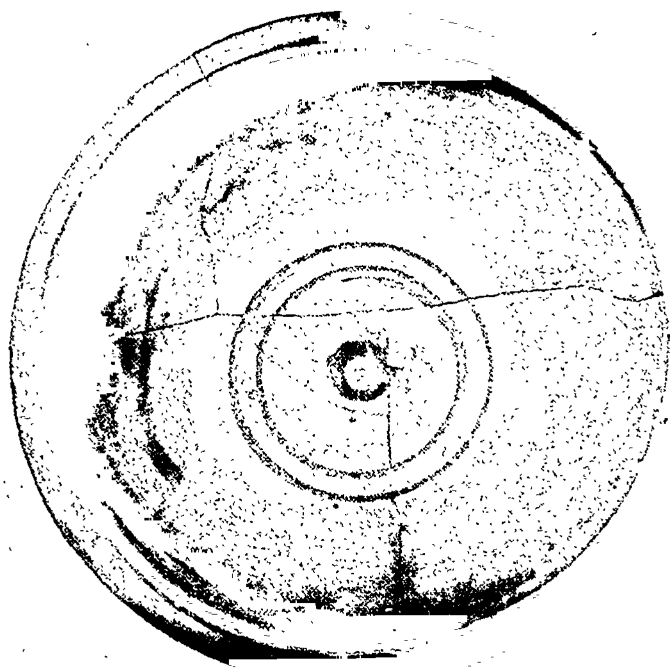
1/3. Bowls, beakers, small vessels, cups and jugs. Variants of types 15, 17, 20. Cf. p. 118—120, 122, 123, 128.
1) (fig. 88:1) I:A13; 2) I:B14; 3) (fig. 84:1) I:B Pit 14; 4) I:AV Pit 20; 5—6) II:H7[1]; 7) I:B6; 8) (fig. 84:3) I:B2; 9) I:B5; 10) (fig. 93:1) I:A13; 11) I:B14; 12) I:A9; 13) I:A5; 14) I:A8; 15—16) (fig. 80:2 and 1) I:B8; 17) I:A9; 18) (fig. 83:2) I:A9; 19) I:B Pit 25; 20) (fig. 83:1) I:B9; 21) I:B12; 22) II:1; 23) I:B8.



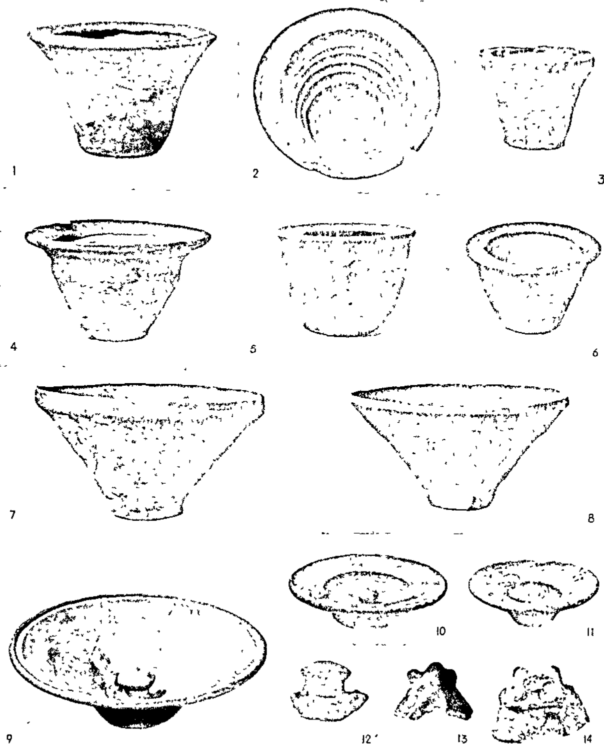
1/3 Dishes and bowls Variants of types 20 and 22 Cf p 124, 125, 128
1) II 2A, 2) I A^V Pit 20, 3) I A^V7, 4) II H6, 5) II H9, 6) II 1, 7) II H9, 8) II 1, 9) I B8, 10) I B6, 11) I B Pit 25, 12) II 15, 13) I B10, 14) I B8, 15) I A Pit 9, 16) I A4, 17) I B8—B9, 18) (fig 89 13) I B7, 19) (fig 90 1) I B Pit 17, 20) I B11







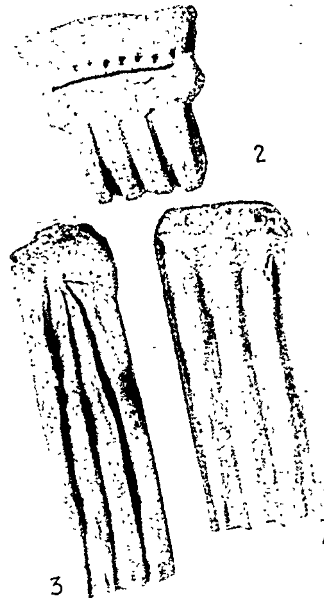
1/3. Bowls. Type 20. Variants cf. p. 124. 1) I:A^{v}3; 2) (fig. 88:8) I:A^{v} Pit 20; 3) (fig. 88:7) II:P.



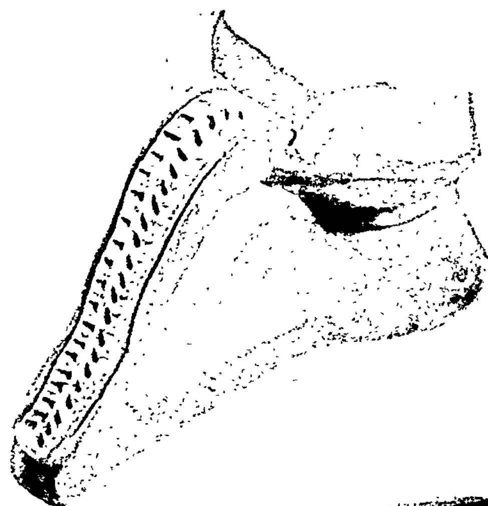
1/3 Flowerpot-shaped bowls, conical bowls and lids Types 20, 21 Cf p. 128 1) (fig 93 6) I A13, 2) II 13, 3) I A9, 4) (fig 93 1) I B9, 5) (fig 93 3) I B9, 6) (fig 93 2) II X, 7) I B11, 8) (fig 94 6) I B Pit 17, 9) (fig 94 10) II H5[2], 10) (fig 94 11) I B13, 11) (fig. 94 17) I A[v]5, 12) II 13; 13) I B Pit 14, 14) II P

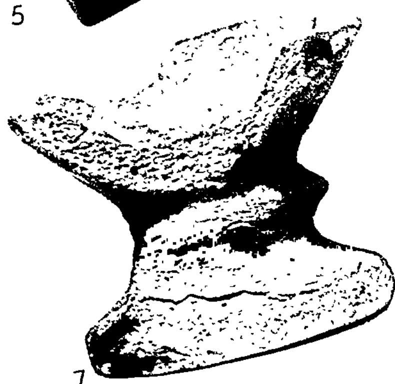
Pl. 68.



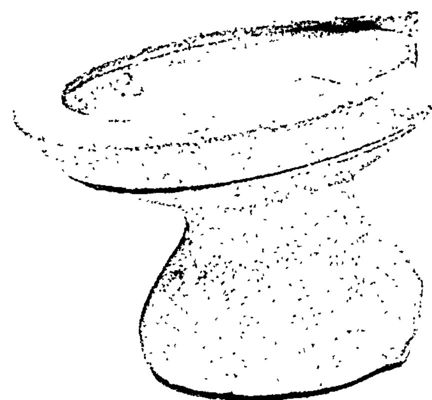








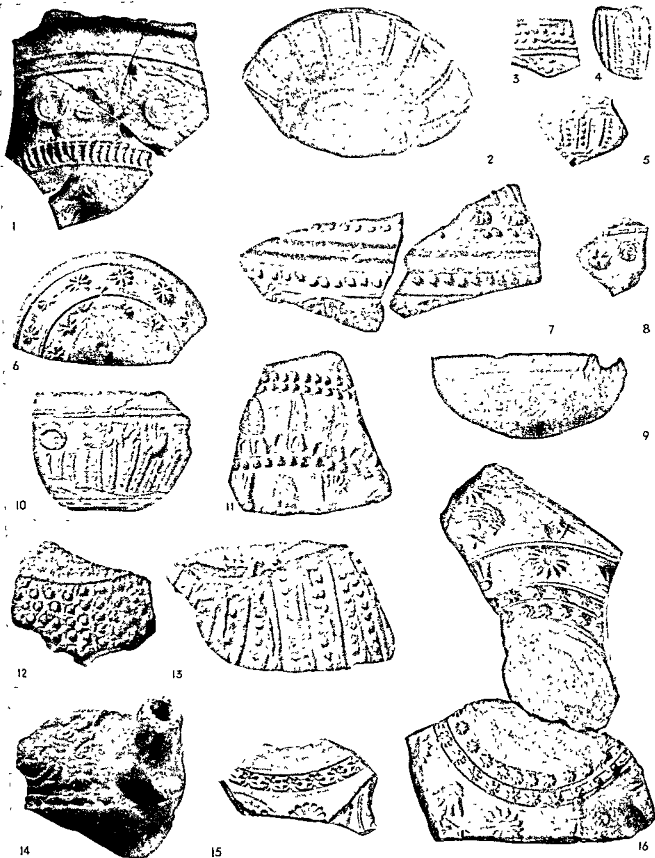




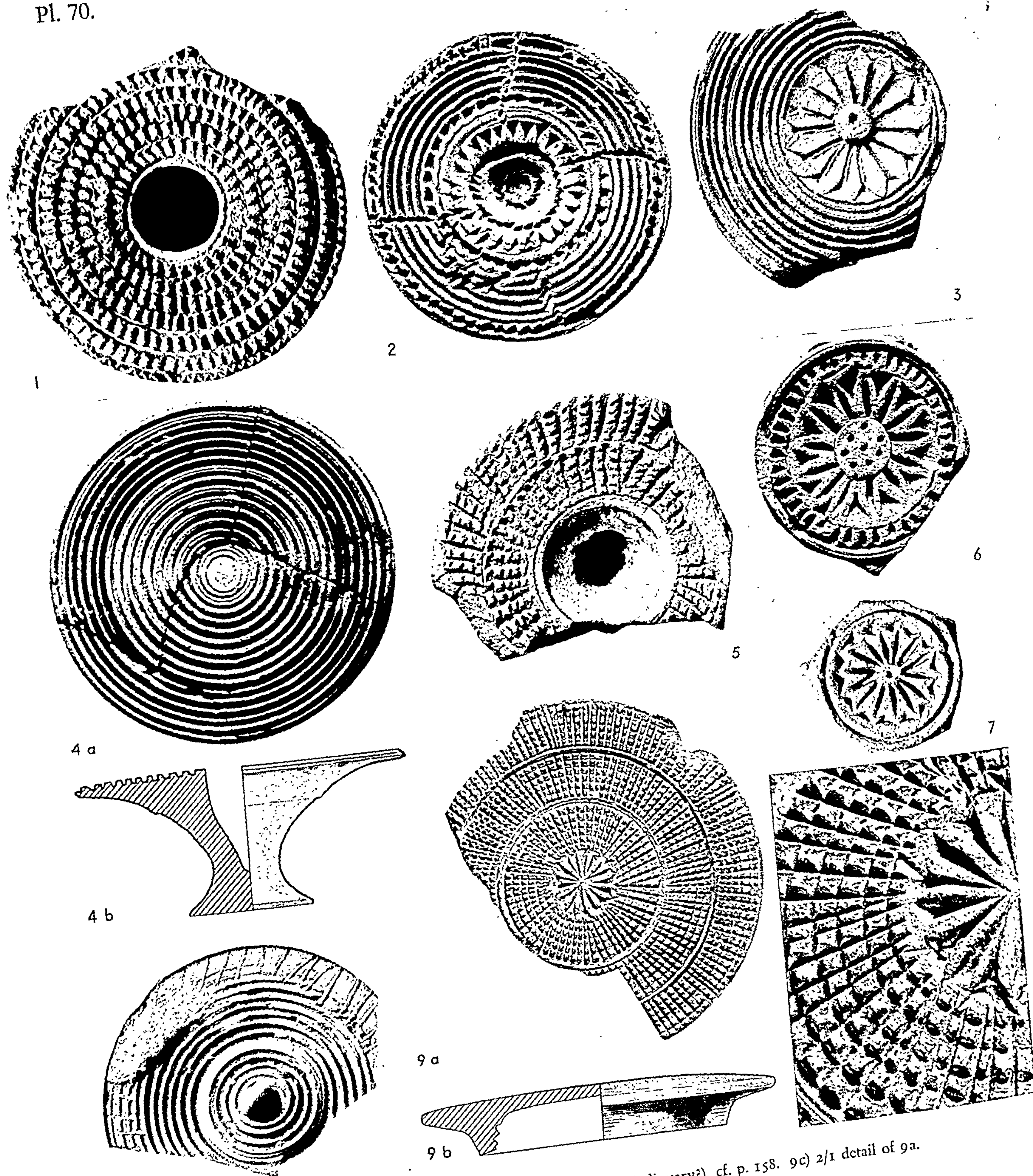




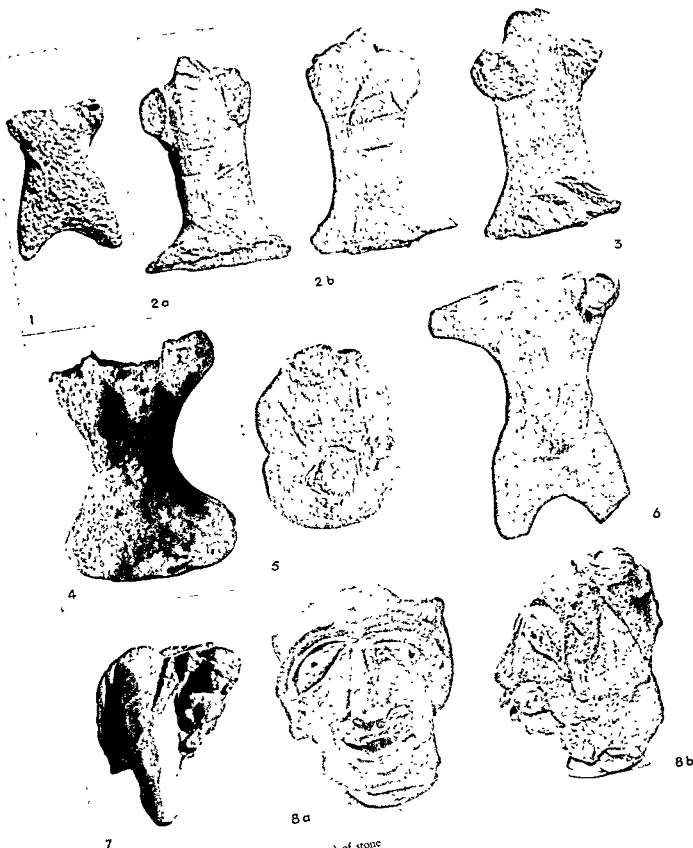
1/2. Incense burners. Type 27. Cf. p. 133 f.
1) I:B6; 2) I:A^{V}4; 3) I:B8; 4) I:B13; 5) I:B Pit 14; 6) S; 7—8) I:A Pit 21; 9) II:H2; 10) S; 11) I:B1.



1/2 1—14) Moulded pottery Type 29 Cf p 134 f 15—16) moulds
1) (fig 100 1) I B12, 2) II 1, 3) (fig 100 2) I B Pit 18, 4) I A S, 5) (fig 100 3) II 1, 6) (fig 100 5) II 1, 7) S, 8) S, 9) (fig 100 4) II 1, 10) (fig 100 6) S, 11—12) S, 13) I A5, 14) I A S, 15—16) S



2/3. 1—8) Potter's or cloth-dyer's stamps; 9) back of hollow plaque (reliquary?), cf. p. 158. 9c) 2/1 detail of 9a.
1) I:B Pit 25; 2) I:B13; 3) I:B9; 4—5) S; 6) I:B14; 7) S; 8) II:4; 9) B7.



1/1 Human figurines 1—6, 8) of terracotta, 7) of stone
1—3) S, 4) I B7, 5) I B9, 6) S, 7) I B7, 8) I B8



1/1. 1—3, 5—6) Human figurines of terracotta; 4) fragmentary terracotta relief.
1) I:A^{v}3; 2) I:B7; 3) I:B13; 4) I:B6; 5) I:A^{v}3; 6) I:B9.

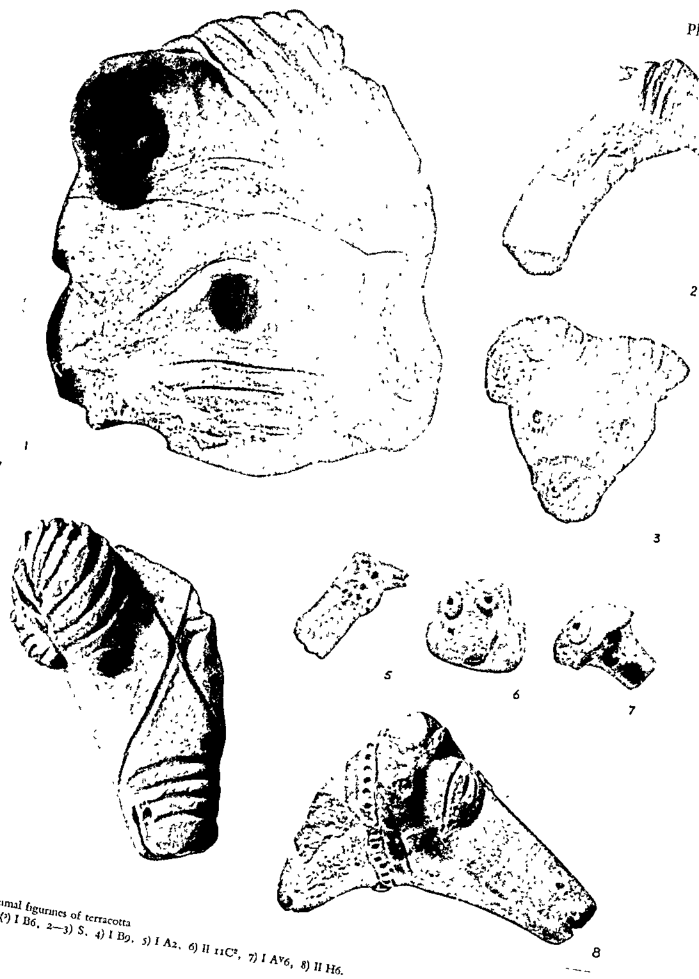


1/1 Pot with heads in high-relief I B10

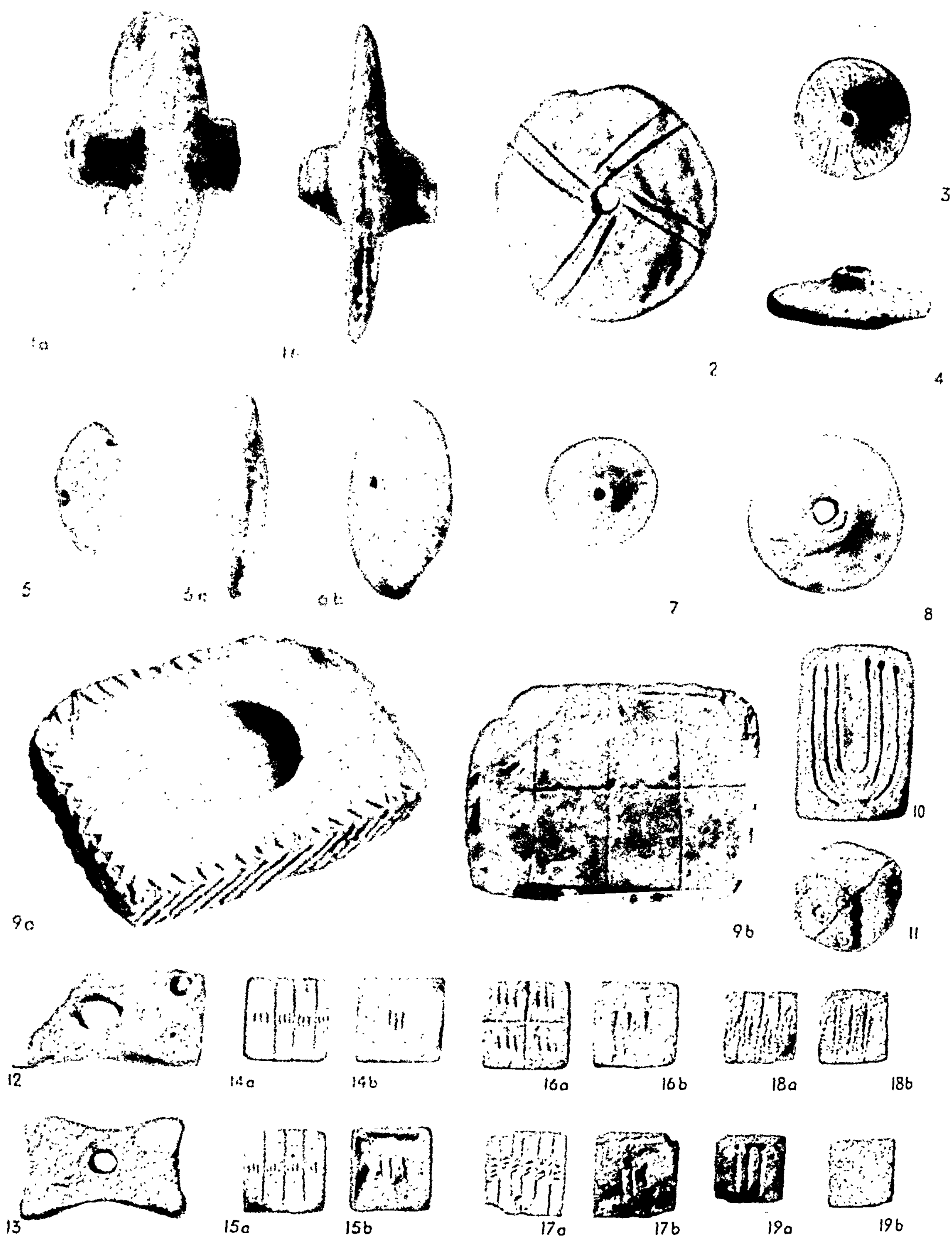
Pl. 74.



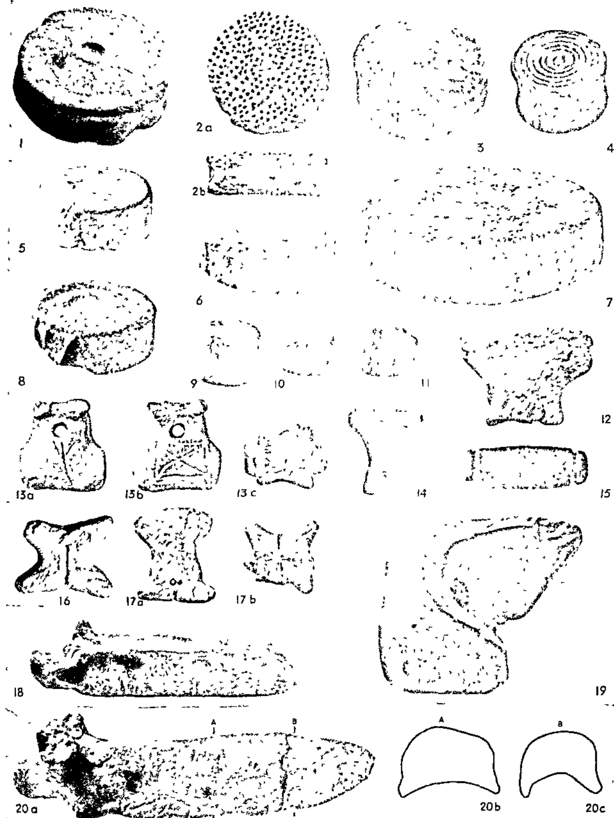
1/3. Animal figurines of terracotta.
1) I:B12; 2) II:4^{2}; 3—4) A^{V}3; 5) II:4; 6) S; 7) S; 8) I:B Pit 14; 9) I:A^{V}6; 10) I:B13; 11) I:B Pit 14; 12) I:A^{V}3; 13) I:A^{V}1; 14) I:A1; 15) I:B Pit 14; 16) I:B4; 17) II:11C; 18) S; 19) I:B7; 20) I:B9; 21) I:B Pit 24; 22) I:A^{V} Pit 20; 23—24) S; 25) I:B7; 26) S.



...imal figurines of terracotta
(?) I B6, 2—3) S, 4) I B9, 5) I A2, 6) II 11C², 7) I AV6, 8) II H6.

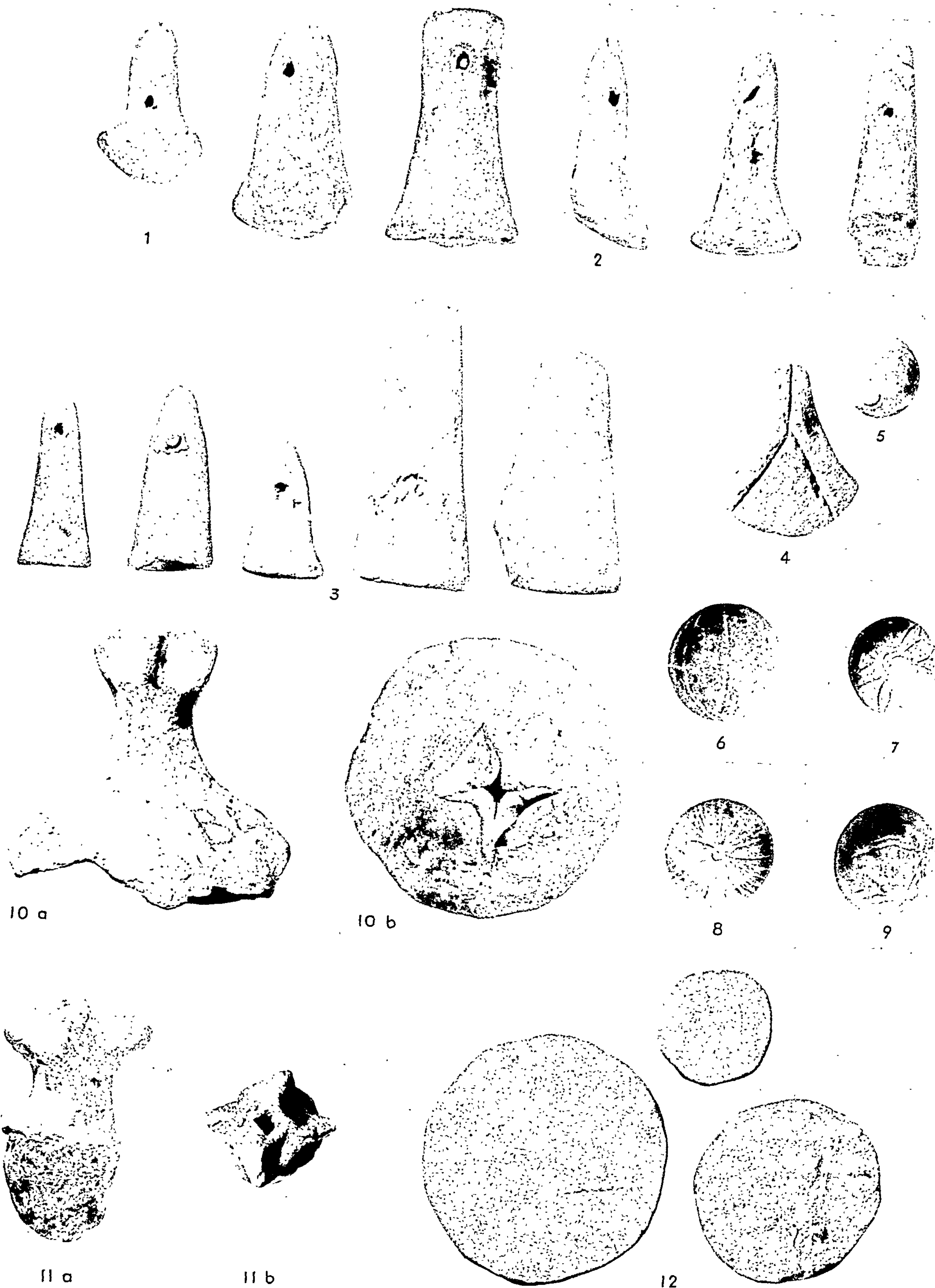


1/2. Objects of terracotta. 1—8) wheels of animal figurins or of small toy-carts; 9—10) plates; 11) die; 12—13) rectangular objects; 14—19) weights.
1) I:A^{v}3; 2) I:A2; 3) I:B Pit 18; 4) I:A^{v}6; 5) I:A9; 6) I:B12; 7) I:A^{v}4; 8) I:B5; 9) I:B7; 10—11) I:A^{v}3; 12) I:B12; 13) I:A6; 14—15) I:A^{v}3; 16—17) S; 18) I:B Pit 24; 19) I:B4.

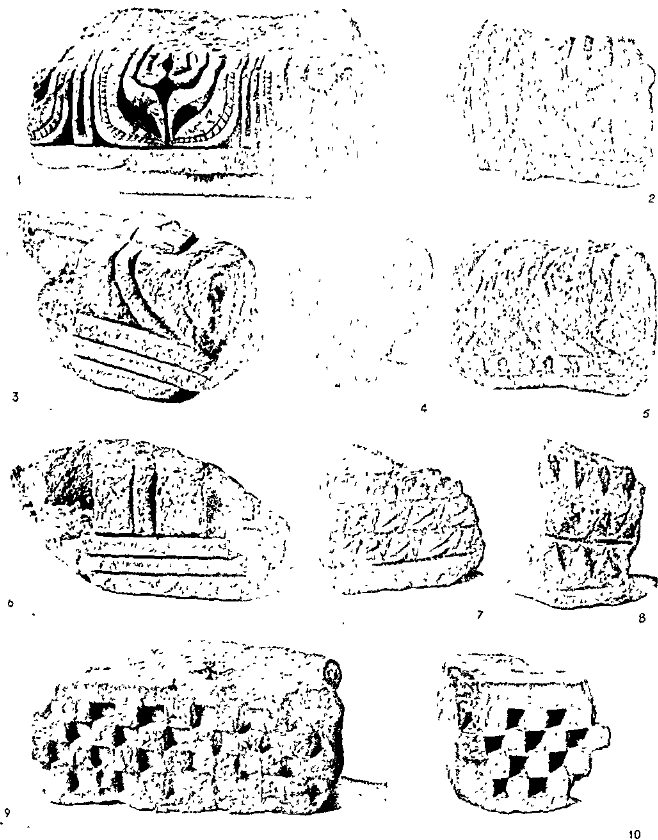


2/3 Objects of terracotta 1—5, 8—11) ear-ornaments, 6—7) flesh-rubbers, 12—14, 16, 17) pendants, 15) object of unknown use, 18, 20) objects with sculptured animal-heads, 19) fragment of toy-cart

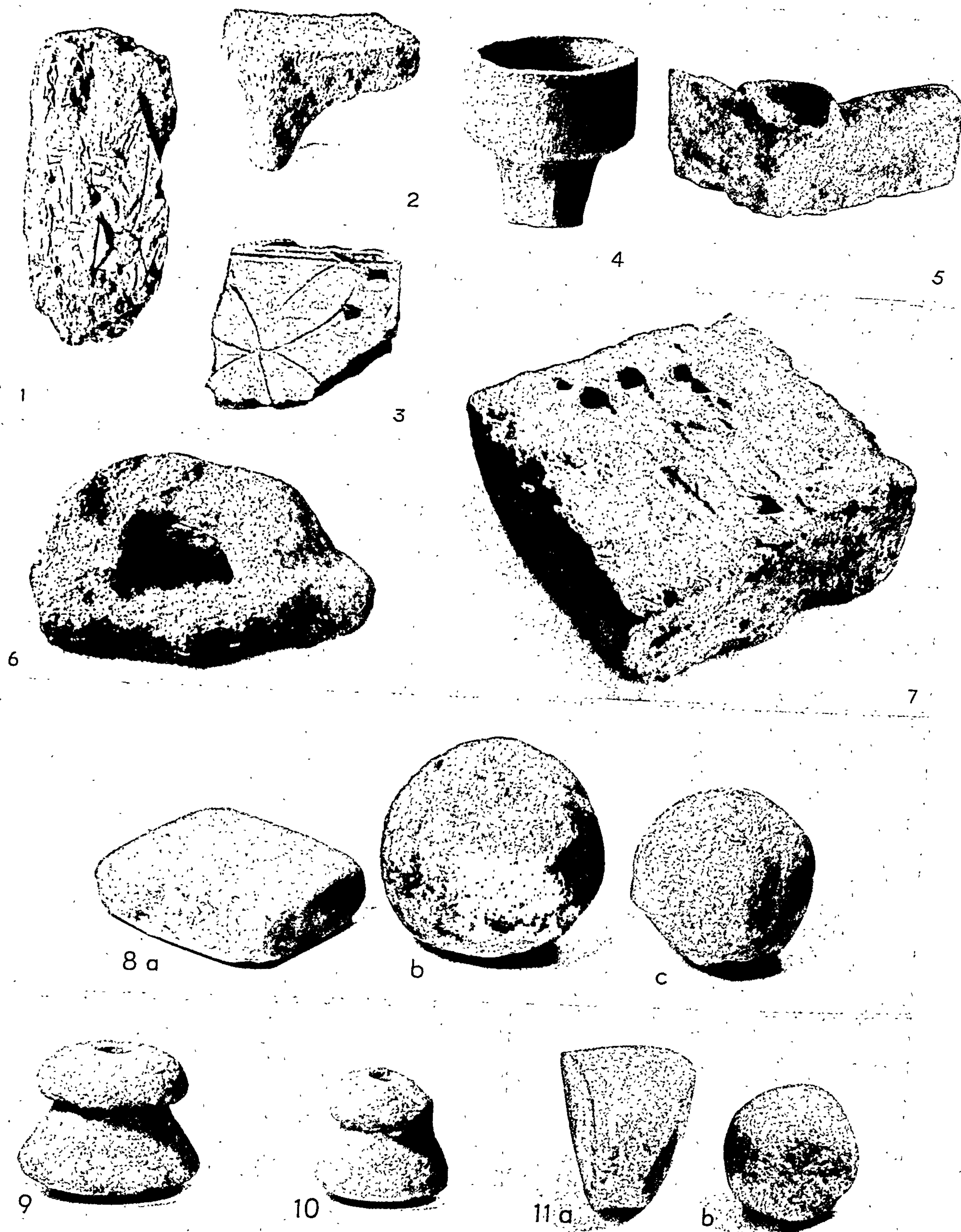
1) I B Pit 14, 2) I B7, 3) I B Pit 14, 4) I B5, 5) I B8, 6) I B5, 7) I B Pit 14, 8) I B7, 9) I A^{v}7, 10) I B Pit 24, 11) I A^{v}3; 12) I B8, 13) I A8, 14) II P, 15) I B13, 16) I A4, 17) I A5, 18, 20) I B Pit 24, 19) I A9



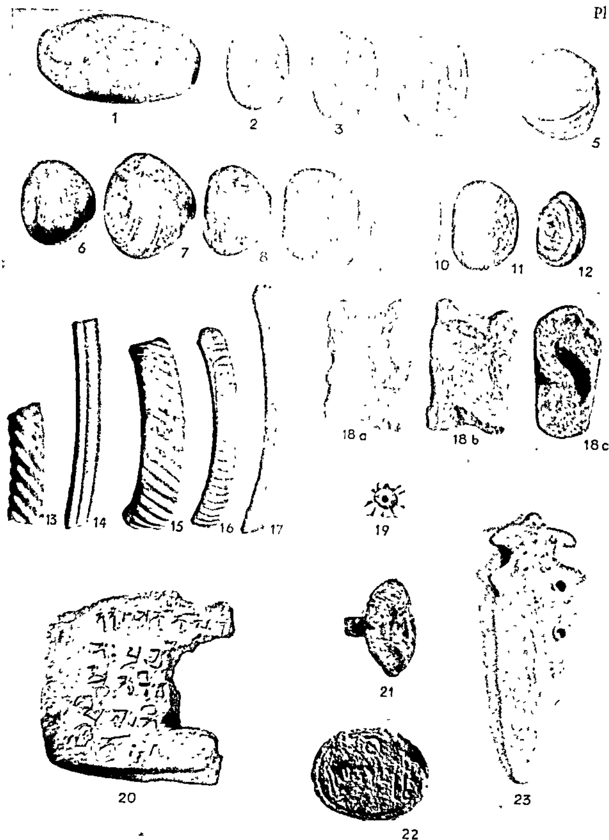
1/1. Objects of terracotta. 1—3) pendents; 4) pendent?; 5—9) balls; 10—11) rattles; 12) small discs, cut out from pot-sherds. 1) I:A10; 2) I:B7, I:B13, I:B10, I:B5, I:B14; 3) I:B2, I:B Pit 18, I:A5, I:B14, I:A^{v}6, I:A^{v}5; 4) I:B2; 5) II:I; 6) II:H3; 7) II:4^{2}; 8) S; 9) I:A^{v} Pit 20; 10) I:B8; 11) I:B8; 12) I:A^{v}3, I:B Pit 18, I:A6.



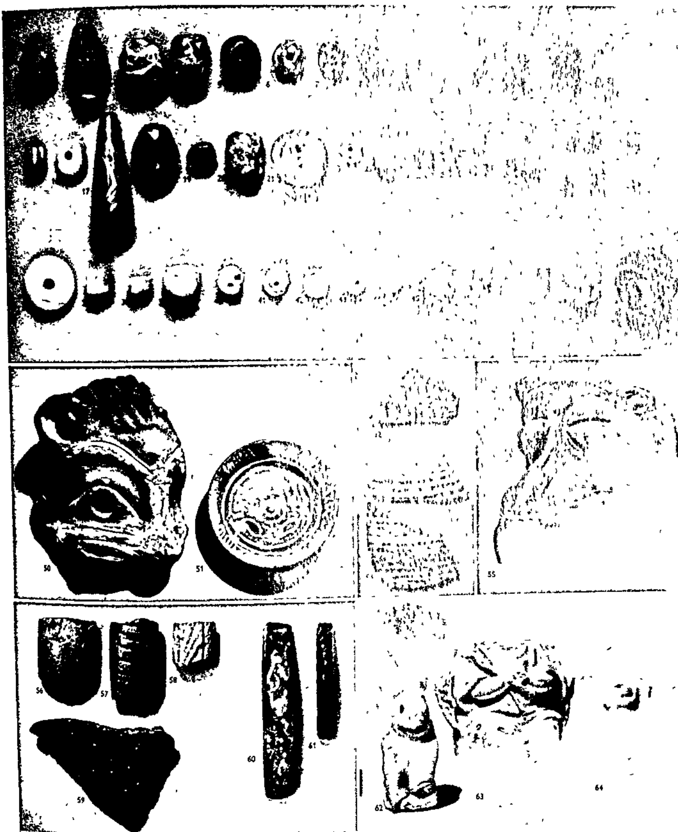
1/2 Decorated fired bricks
1) II 1, 2) II 13, 3) II:12, 4—5) II.S, 6) II 7[1], 7—9) II S, 10) II·15



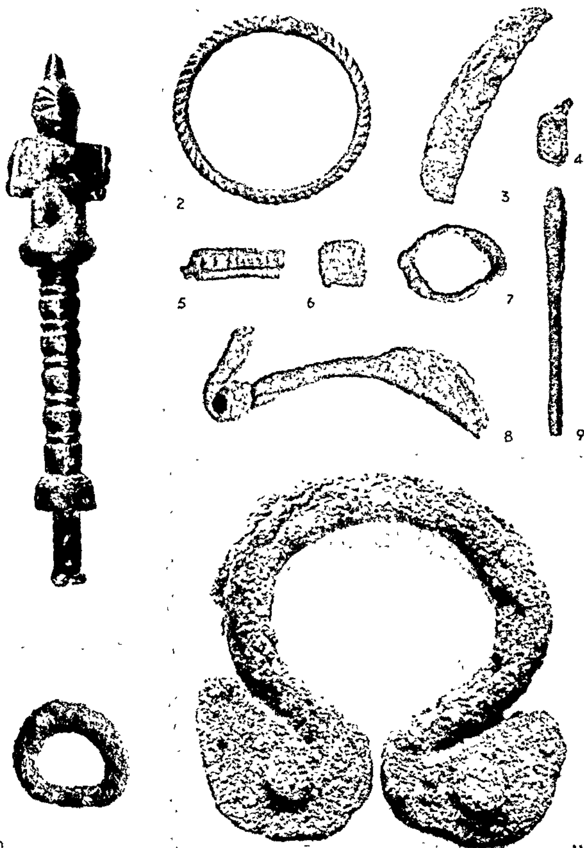
1—7) 1/4. 8—11) 1/2. 1—10) Objects of terracotta; 11) of stone.
1) Decorated fired brick S; 2) fragment of stand S; 3) brick with incised ornament S; 4) fragment of drain pipe(?) I:B8; 5) fragment of votive tank I:B5; 6) dabber for packing II:I; 7) coarse brick with parallel grooves I:A11; 8a) square plate II:4a; 8b—c) big balls I:B13, B9; 9—10) "konoras" I:A1, B8; 11—12) mullers I:B4, B Pit 17.



1/1. 1—12) Terracotta beads, 13—17) shell bangle[illegible] [illegible]ith nob of bronze, 20) terracotta-tablet with inscription, cf page 176,
1) II Av4, 2) II H5, 3) II·12, 4) II 1, [illegible] 11) I.B13; 12) I.B7, 18) I.A5;
19) I B2, 20) I B6, 21) I Av4, 22) I [illegible], 23) I A·3.

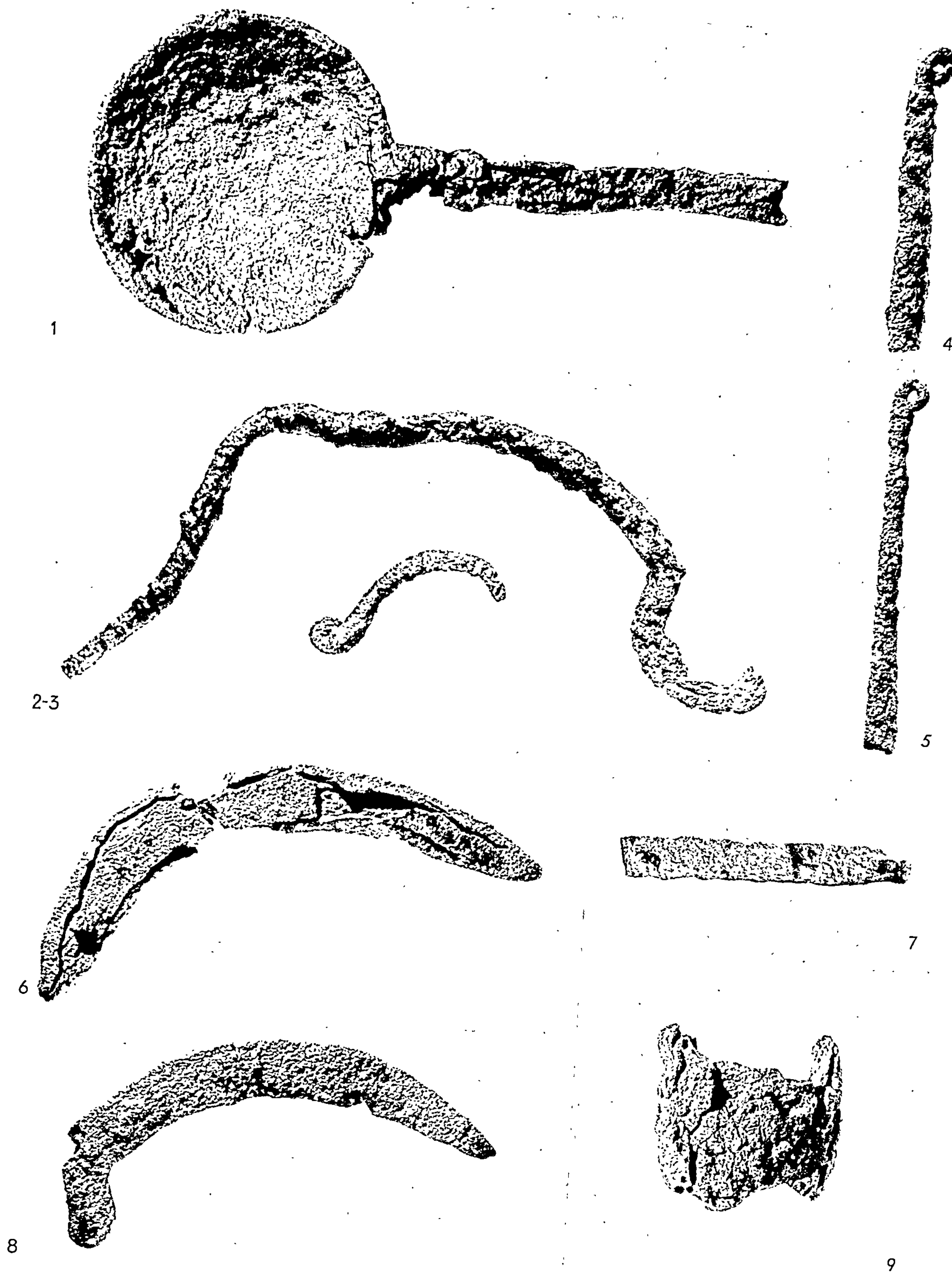


1—49, 56—61) 1/1, 32—54) 1/2, for scale of the other objects see the reproductions indicated below in brackets
1—47) Beads of different material, cf. p 167f, 48) polished rock-crystal fragment, 49) glass marble, not pierced through, 50) animal-head, mask(?), of terracotta (pl 75 1), 51) small plate (pl 63.16), 52) painted pottery fragment (pl 39 9), 53—54) pottery fragments (p 136), 55) spout (pl 47 6), 56—58) fragments of bracelets of glazed pottery (p 136), 59) fragment of glazed pottery (p 136); 60—61) fragments of glass bracelets, 62) fragment of small porcelain figure (fig 105 3 and p 159), 63—64) fragments of small faience figures (fig 105 2,1 and p 159)

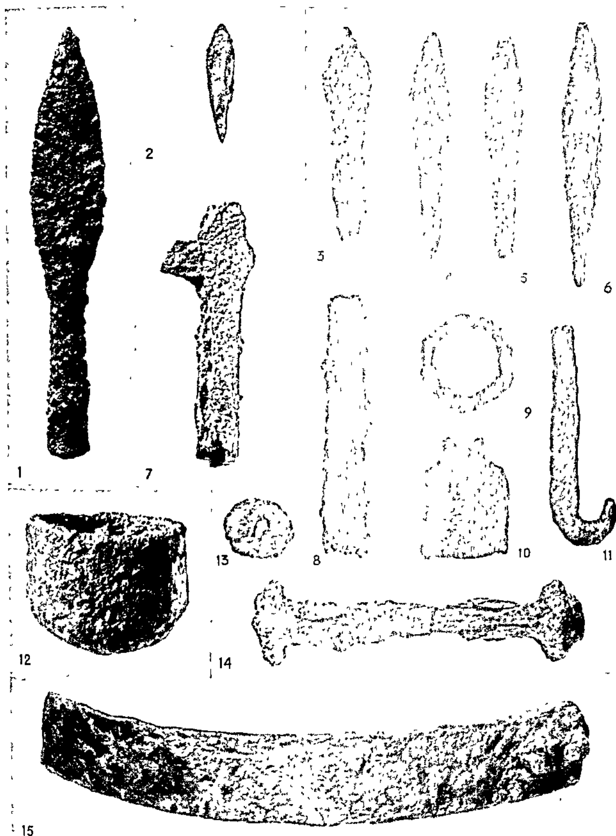


1/1 Objects of bronze

1) Handle of a bell I A5, 2) bracelet I A14, 3) fragment I B9, 4) fragment of a finger ring I B8, 5) fragment of bracelet II III; 6) mounting I B11, 7) ring I B10, 8) handle (?) II.H4², 9) pin I A'3, 10) clasp I A10, 11) mounting I A14

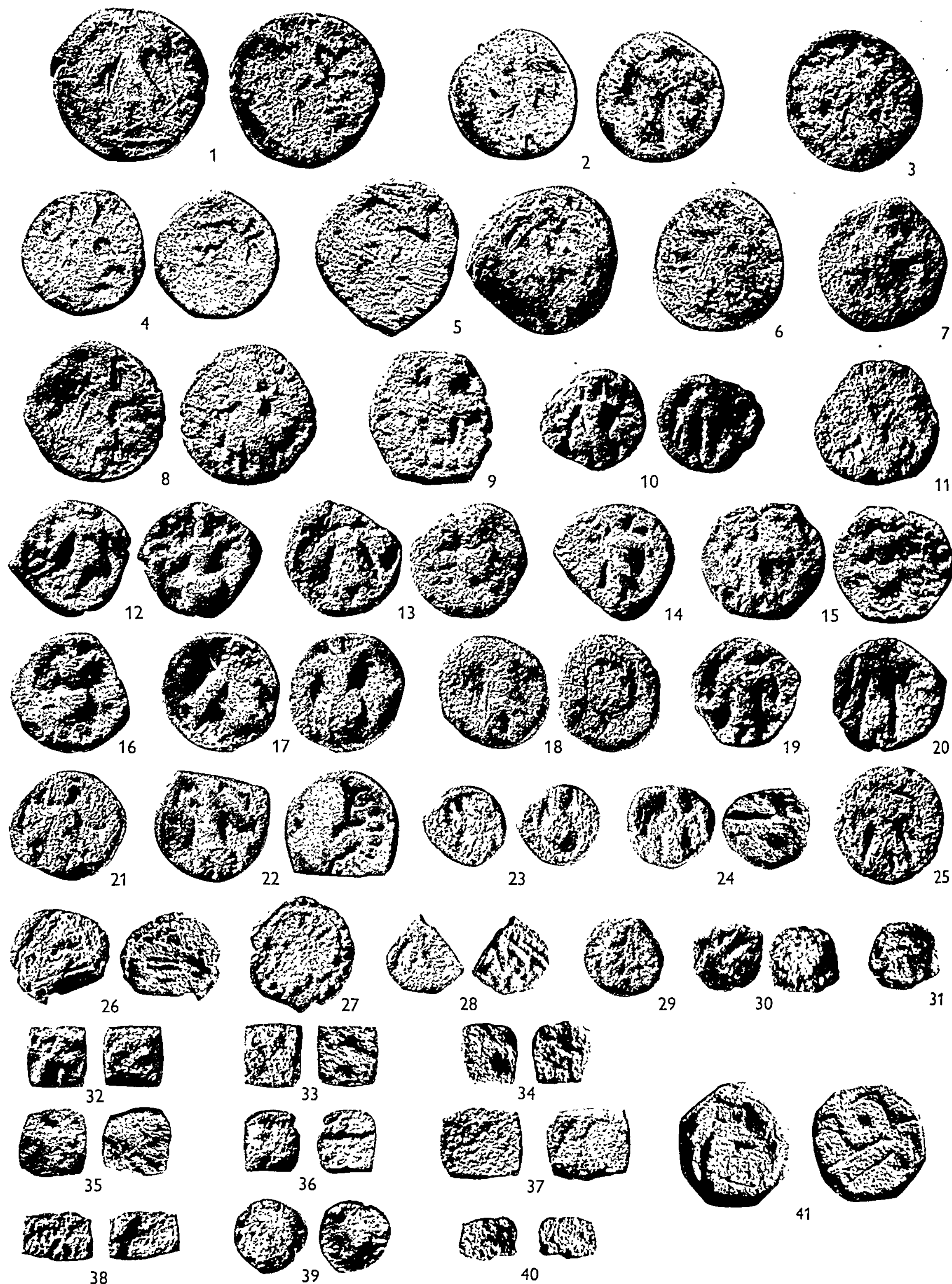


1/1. Objects of iron.
1) Ladle II:H3[2]; 2—3) handles I:B12; 4—5) sockets II:H7; 6, 8) sickles II:H9; 7) mounting II:H5[2]; 9) ring-shaped mounting II:H6[3].



1/1 Objects of iron

1) Spear-head I A11, 2) arrow-head (?) I·A6, 3—6) arrow-heads I B14, II 2A, I B12, I A'6, 7—8) Sockets of spear-heads, I Av8, I B Pit 25, 9) ring II H6a, 10) small bell I B11, 11) hook I B7, 12) small bowl or mug I A10, 13) mounting II H3, 14) rivet I A7, 15) mounting I B7



1/1. Coins of bronze.

1—3) Kanishka I. I:B6, S, I:A4; 4—7) Huvishka. I:A4, I:B9, I:A5, S; 8—11) Vasudeva. II:4, S, S, I:B13; 12—16) Kanishka III. Tank, I:B13, S, I:B8, I:B11; 17) copy of Kanishka III. I:B10; 18—25) "Murundas". Tank, I:A^{v}4, I:A^{v}6, I:A11, I:A^{v}6, I:A^{v}6, II:4, I:B12; 26) uncertain I:B8; 27—32) not determined. I:A^{v}4, I:B12, II:I, I:A8, I:A^{v}3, I:A10; 33) uncertain. I:B9; 34—36) punch-marked(?). I:B9, I:A^{v}3, I:A4; 37—38) undetermined. II:I, I:B9; 39) punch-marked. II:4^2; 40) tribal coin. I:B13; 41) Akbar. Moslem grave 1.